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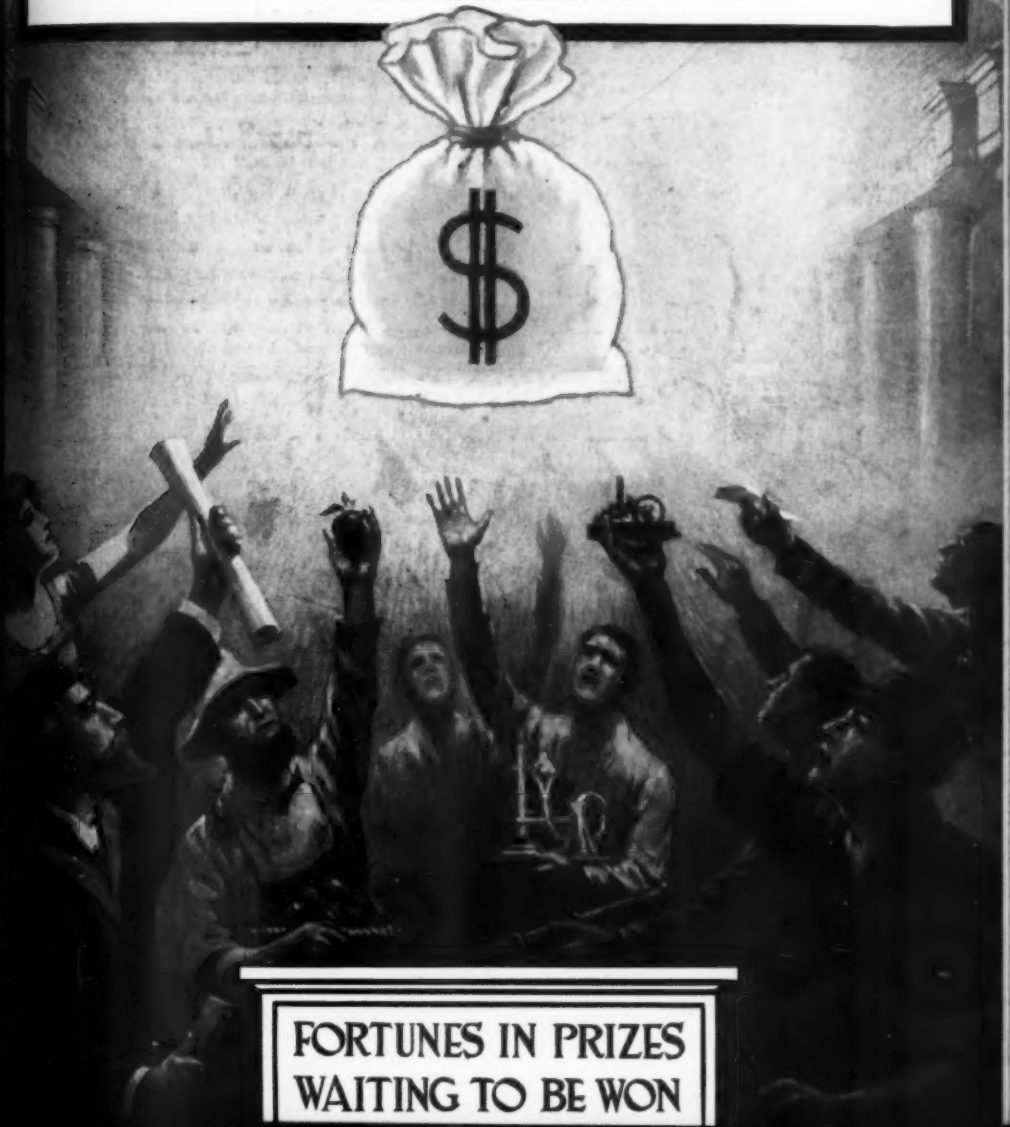

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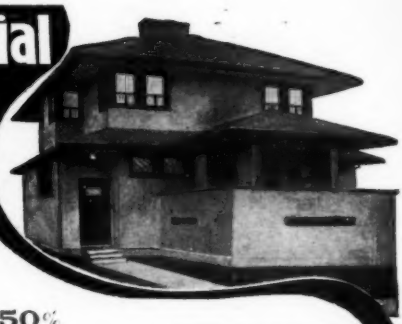

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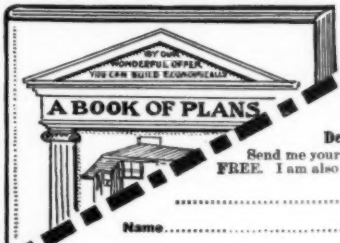

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EDITED BY H. H. WINDSOR

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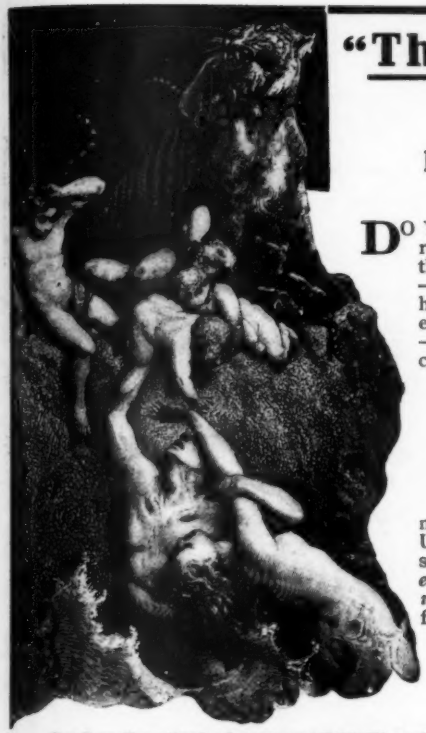

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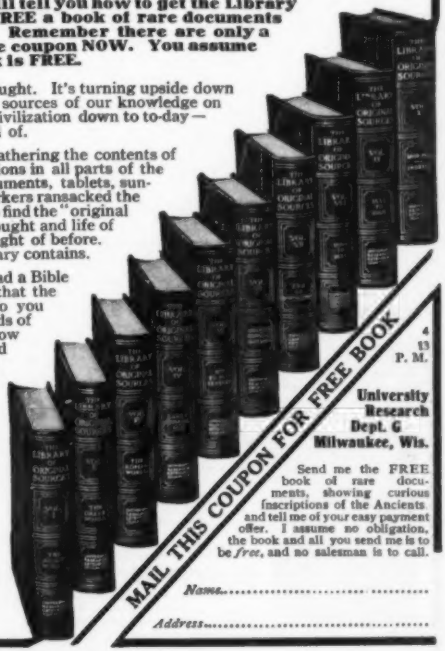

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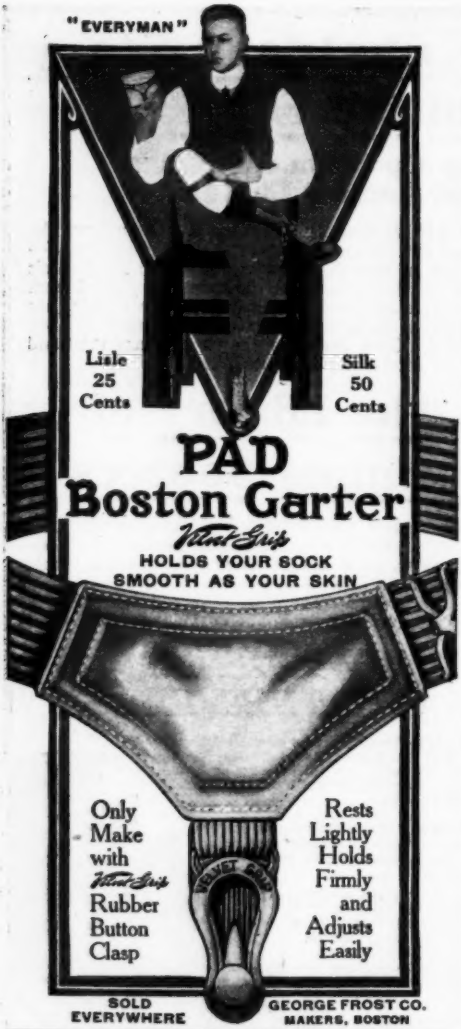

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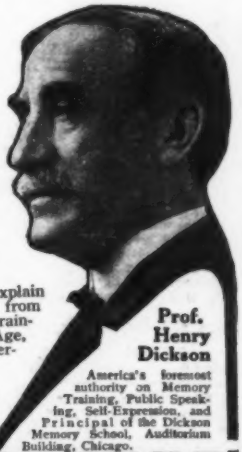

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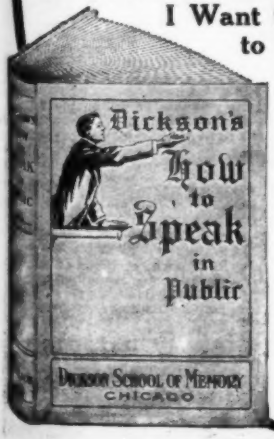

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Classified Advertisements

Advertisements in this section, 15 cents per word, each insertion, minimum 10 words, payable in advance. To insure ads being inserted under proper classified head in the May issue, copy must reach this office not later than April 1st.

Philadelphia, Pa., December 27, 1912

Popular Mechanics Magazine, Chicago, Ill.

Gentlemen: You are entitled to know that the small 33 word advertisement which we had in your magazine brought replies from every conceivable corner of the globe. Not only was practically every state in the Union represented, but Porto Rico and Hawaii as well.

We consider this nothing short of marvelous results from so small an ad and are preparing plans to further use your columns to the limit of their possibility, and you will hear from us at a later date. We thank you for your interest in our behalf and are,

Very truly yours,

(Signed) AMERICAN CUCKOO CLOCK CO., Inc.

AUTOMOBILES

BROKEN Cylinders and Crankcases—Send them to be made good as new at fraction of replacement cost. Scored cylinder repaired, $12. No new piston and rings required because bore is not enlarged. Where cylinders are worn (not scored from loose wrist pin) reboring is only remedy. We do it expertly. Write for complete information and estimates. Waterbury Weld Company, Waterbury, Conn.

OXY-ACETYLENE Welding, Cutting and Brazing. We have a large Oxy-Acetylene Department, employ only experienced men and are prepared to do the simplest or the most difficult work. Proposals solicited. The Alexander Milburn Company, Baltimore, Md.

4 CYL. 4 x 5 motor, new, $50; Chalmers 30, 4 cyl. with taxicab and touring bodies, $450; Marion 30, 4 cyl., 5 pass., $425; Stearns 30-60, 4 cyl., 7 pass., $450; Rambler, 4 cyl., 5 pass., $450; Flanders 20, 4 cyl., 5 pass., foredoor, $600. Winnetka Garage, Winnetka, Ill.

DIAMOND Tires, 28x3 $8.70; 30x3 $9.30; 36x3½ $13.70; 32x3½ $14.65; 34x4 $21.65. Other sizes accordingly. Dunlops 1% extra. 10% with order, balance C. O. D. Auto Tire Brokerage Company, 1406 Michigan Avenue, Chicago.

If it's a matter of price, consider rebuilt and repainted automobiles. Write for Bargain sheet; we will surprise you. Eureka Auto Co., Beavertown, Pa.

FOR Sale—E. M. F. Automobile 1911 Model just repainted. Cheap if sold before April 20th. Send stamp for particulars. Claude Lusk, Wapakoneta, Ohio.

BIG Bargains—5 Passenger Steamer $275. Steam Truck $425. Fully equipped, perfect mechanically, kerosene burners. Will demonstrate. L. G. Snyder, 5635 State St., Chicago.

FORD owners wanting five electric lights using Ford magneto and storage battery (self-contained system), write American Battery Company, 1129 Fulton St., Chicago.

FOR Sale or Trade—One truck, one taxicab, three pleasure cars. Photo. upon application. Hauber Auto. Works, St. Marys, Pa.

AUTOMOBILE Instruction. A complete home study course that shows you exactly what you want to know about the automobile. 220 page book giving definite, thorough, authentic and practical detailed information about every part of the automobile as well as thorough instruction in regard to driving, repairing and general care of the complete car. 190 illustrations, $1.50 postpaid. Popular Mechanics Book Dept., 318 W. Washington St., Chicago.

FOR Stanley Steamers; Newport Condenser Outfits, Kerosene-Distillate, Naphtha-Gasoline Burners, High Pressure Water Gauge. 526 Fourteenth, Denver, Colorado.

OXY-ACETYLENE Welding—Directions construction use plant from materials handy. Scale drawings, fluxes, formulas. Practical complete. 50c. American, Aberdeen, S. D.

SIX Little Yankees kill carbon in automobiles and motor boats. Non-liquid, non-explosive, harmless, handy, clean. Get more power, smooth running engine, use less gas. $2 box. All dealers. Six Little Yankees, Philadelphia.

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MOTOR delivery truck, $275. Two grinding or polishing lathes cheap. George Wills, Canal Dover, Ohio.

INCREASE your income. Get our complete transfer outfit for Monogramming autos and motorcycles. Motorists Accessories Co., Ashland, O.

BATTERY Tester size of watch, $5c postpaid. All kinds electric auto supplies. Catalog. Boyd Sales Co., Philadelphia, Pa.

FOUR cylinder Ford, $150. White steam automobile, $70. Excellent conditions. W. Robb, Canal Dover, Ohio.

STEAM Car Correspondence School. Particulars, 526 Fourteenth St., Denver, Colo.

AUTOMOBILE Driving Self-Taught. An exhaustive treatise on the management, care and operation of Motor Cars. 250 pages, liberally illustrated, $1. Profitable Service Bureau, 4333 N. Sawyer Ave., Chicago.

$375 BUYS two passenger Maxwell. Full equipment, including Gas Lamps, Wind Shield and Top; also extra tire and case. Robert C. Fay, 1303 Heyworth Bldg., Chicago.

WAVERLY Electric Runabout; has no battery; otherwise condition good. Cheap for $110 to quick buyer. Breslin Garage, Albany, N. Y.

HOW to Repair Automobiles. Large book $1 postpaid. Satisfaction guaranteed. Nelson Book Co., Barton, Vt.

LEARN How to Run An Auto. Audel's Answers on Automobiles will teach all about Carburetors, Ignition, Timing, Engine Troubles, Overhauling and Driving. A complete course of 500 pages with 375 diagrams, highly endorsed by men who know. $1.50 to any address. Money back if not pleased. Theo. Audel Co., 72 Fifth Ave., New York.

HOW to time automobile, air ship and motorcycle motors, correct, simple, postpaid 25c. J. C. Gehring, Ft. Wayne, Ind.

CHAUFFEURS—Before taking examination send ninety cents for questions and answers, with instructions for securing license. L. I. Lutes, Ex-State Examiner of Chauffeurs, Utica, N. Y.

MUST sell my Reo five passenger touring, elegantly equipped and perfect in every way. $175. Dr. Spiliane, 248 East 119th St., New York City.

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AUTOMOBILES. I have all makes on my list, runabouts, $50 up; Touring Cars, $75 up; all guaranteed and shipped freight prepaid, send for my list before purchasing. P. King, 213 West 125th St., New York City.

350 AUTOMOBILE and Motorcycle Tours. Illustrated; Ideal Trips; best roads in each state; 50 maps; complete road directions, 15c postpaid. Address "Motor Tours," 51 Chambers St., New York City, N. Y.

WHITE Steam Automobiles, second-hand and new; all second-hand parts, Whites, Stanleys, Locomobiles, or other Steam Automobiles. Prices reasonable. State your wants. Lake View Garage, Lake View, New Jersey.

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AVOID accidents. Dim-a-light, the new device for controlling the glare of electric headlamps. Pellets Magneto Exchange, 1463 Michigan Avenue, Chicago, Illinois.

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TWO 20th Century tire protectors, size 34x4, never used, $12 each. Frank Whitten, Blackfoot, Idaho.

THIS month only—One dollar for Fire Extinguisher, no danger of losing your auto by fire. M. Dutton, Lawrence Ave., Norfolk, Virginia.

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BIG money vulcanizing at home. Easy learned. Book 25c. Vanderpool's, Springfield, O.

THIRTY hp. engine and transmission $250. Wheels, tires, rims, axles, radiator, lamps, searchlight and generator, magneto, Schebler carburetor, Unit sparker, springs, steering. One portable garage. Prices low. Write quick. Chesney L. Jones, Haskell, N. J.

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NEW Pressed Steel Frames, 34x163", each $10. Automobile boilers bought, sold and repaired. New 3 ton chassis and wheels $100. Lucas & Son, Bridgeport, Conn.

TOOLS and Tool Chests, and Other Tools, for the autoist, shop and home—are listed and described in the Tool Monger, a 390-page catalog mailed on receipt of 6c in stamps. Montgomery & Co., 105 Fulton St., N. Y.

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ADVISE us make and model motorcycle wanted and we will quote lowest prices. Terms to suit. Rogers Bros., 21 Irving St., Waltham, Mass.

200 MOTORCYCLES, Standard makes guaranteed for season, $50, $175. Accessories: heavy carrier, $3; headlight, $3.50; Speedometer, $10; tires, $5. Chicago Motorcycle Works, 738 Sheridan Rd., Chicago.

LATEST Wagner; overhauled; new piston and rings; "V" belt; combination seat and luggage carrier; excellent condition, $90. Ralph Glerum, Devils Lake, N. D.

100 BICYCLES slightly used and second-hand $7 up. Covington Cycle Wks., Covington, Ky.

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RIDERS Avoid accidents by buying our Mirrorscope Goggle and see everything behind you without turning around. $1.75 each. $1.75. Send for list of other specialties. The B-L Sales Co., Dept. A, 53 W. Jackson Boul., Chicago, Ill.

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10 DIFFERENT Exposition Post Cards, 10c, postpaid. Exposition Mail Order Co., Box 2446, San Francisco, Cal.

PHOTOS—"Pretty Girls," 24 artistic beauty poses, 10c. Lists, 2c. Curtis Co., J—Englewood, Chicago.

FUN! Corresponded privately, years, on common Post Cards! (Unsealed.) Common ink. New way! Directions, 10c. Verne Michener, Salem, Iowa.

PICTURES and Postcards. Hawaiian Post Cards beautifully colored, 12 for 25c. Hawaiian Service Bureau, Honolulu.

20 BEAUTIFUL Postcards; Greeting, Birthday, Best Wishes, Congratulations, Flowers, Views, etc. Gold, embossed, etc. 10c. 100 40c. Bailey, 110 Maple, Napanoch, N. Y.

GREAT Pastime. Exchange postals. "True-Blue" has perfect plan. Leading club; many members; big monthly magazine. Write to Ed Ericson, Elroy, Wis.

CARDS exchanged for results. 10c membership. Pacific Card Exchange, Bryn Mawr, Wash.

GET acquainted all over the world. Exchange post cards. Membership 10c. Universal Exchange, 3859 Coral St., Philadelphia, Pa.

25 BIRTHDAY, colored views, 10c. Hundred, 35c. Catalogue, duty free. Awdrey McCreery & Co., Wallaceburg, Ont.

NIGHT Scene Post Cards. Flashlights from life. Eight for 12c. S. Wra, Longbeach, Calif.

POSTALS—Just Girls; 10 nifty poses 10c. 30-25c. Bailey, 110 Maple, Napanoch, N. Y.

PHOTOS, pretty girls. 10 nifty poses, 10c. Lessig, 3859 Coral St., Phila., Pa.

5 SPORTING Postcards, 10c. Miss A. A. Banner, Station "R," N. Y. City.

ARTISTIC hand-colored Photos. Beautiful landscapes. Oil Painting and Water Colors. Write today. August Duna, 138 Zeigler St., Boston, Mass.

IF you really want to exchange post cards, try our splendid club. Lists circulate in many countries. Membership, 10c. Halcyon Club, Box 133, Erie, Pa.

OUR members in Norway, Switzerland and everywhere would like to exchange cards with you. Membership 10c. International Post Card Exchange, 2917 Washington Blvd., Chicago, Ills.

YOU'LL get cards from everywhere. Membership 10c. Idaho Card Exchange, Dept. K, Box 906, Boise, Idaho.

CAMERAS AND PHOTO SUPPLIES

LEARN Transphography—Make beautiful colored transparent photographs, on watch dials, chinaware, silverware, glass, celluloid, etc., with Transparo. Cost 1c each, sell, $2. Learn in one hour. No tools required. Knowledge of photography unnecessary. Mr. St. John, Bridgeport, Conn., says, "Transparo is O. K." Sample bottle, formula, and instructions 25c. E. Greenhalgh, 816 58th, Brooklyn, N. Y. "If it isn't from Greenhalgh—it isn't Transphography."

LET experts finish your valuable photographs. Developing free. Prints, postcard size, five cents, others proportionately. We do anything, photographically speaking. The Landell Studios, 3712 Ivy St., Indiana Harbor, Indiana.

ROLL films developed, 10c. Printing Post Cards, 3 cents each. 15 years' experience. Send for complete price list. F. C. Hoyt, Sac City, Ia.

AMATEUR Photographers, send stamp and film for sample of the best postcard you ever saw. W. R. Clement, Box 1046, St. Louis, Mo.

KODAK Films developed and printed and enlarged. We develop any film 10c, we make any print up to 5x7 3c. We make an 8x10 enlargement of any negative for 25c. Brownie film developed and six prints and one 8x10 enlargement 50c. Price and Quintard, Poughkeepsie, N. Y.

TO introduce our superior finishing, during March and April one roll film developed and printed and 8x10 black or sepia Mounted enlargement for 35c. "We finish your Kodak pictures better." Colonial Art Company, Box 566, St. Louis, Mo.

PEERLESS Folding Dark-Room. Stop sending out films, and wasting money. Peerless eliminates all discomfort or ordinary darkroom and serves all its purposes. Operation visible. Illustrated pamphlet free. Maslo Mfg. Co., Box 733-B, Indianapolis, Ind.

THE Kamera Shop, 179 Auditorium, Chicago, offers good developing and printing by mail. Prove our quality, send any six exposure roll with three dimes for developing and six velvet prints. Booklet free.

MAIL us your Kodak work. Films developed, 10c per roll all sizes. Prints 2c up. Post cards 4c. Good work and prompt returns. Tuthill Studio, Middletown, N. Y.

BIG Money Saved on Photographic Lenses and Apparatus—goods exchanged; repairing done. Ralph J. Golsen, 65 East 46th Street, Chicago, Department P.

FREE. Enlargement from your negative, with every $1.50 order. Photographic finishing. Erhard Westman, St. James, Minn.

FILMS Developed. Send me your films for best work. Send negative for free sample print, and prices. Henry Schall, 256 North Main, Decatur, Ill.

BOYS: Make your camera pay. My plan tells how. Send 25c. W. H. Fowler, Rogers, Ark. Box 23.

5x7 CAMERA, complete outfit. Want small gasoline engine. H. R. Dague, Washington, Pa.

THE Latest Invention. Combination Moving Picture Camera, Projecting Machine, printer, stereopticon and photo enlarging machine combined in one. Simple, compact, anyone can operate it. Standard size film. Compact Camera Works, 213-215 S. Leavitt St., Chicago, Ill.

FILMS Developed Free. Prints 3c up. Send two negatives, any size, for sample cards. Monroe Co., Jamestown, N. Y. Professional Experts.

FILMS developed, ten cents per roll. Best results guaranteed. Jackson, 74 Woodward Ave., Detroit, Mich.

KODAK Films Developed, 10c per roll, any size. Prompt attention given mail orders. Prints 2¼x3¼ to 3¼x4¼, 3c; 4x5 to 3¼x5½, 4c. J. M. Manning, Box B, 1062 Third Ave., New York City.

PHOTOGRAPHS wanted by publishers. I'll find a buyer for all prints I deem worthy of publication. Send your name on a postal for leaflet of instruction. A. S. Dudley, Photographic Expert, Box 775 C, Philadelphia, Pa.

PHOTOS copied on Post Cards, Lockets, Stamp Photos. Samples and Illustrated Catalogue 4 cents. Westlake Co., Brooklyn, N. Y.

WE buy, sell and exchange. Bargains in Microscopes, Telescopes, Binoculars, Cameras, etc. Bargain list sent. Kahn & Son, Opticians, No. 54 John St., New York. Established 62 years.

BROMIDE Enlargements 11x14, 50c; 8 x10, 25c. Kodak Developing and Printing—the better kind. All work guaranteed satisfactory. The Rex Studios, 60th and Girard Ave., Philadelphia.

POCKET Photo Outfit, very cute; full outfit prepaid 10 cents. Warfel, Photographer, Cadiz, Ohio.

MONEY in Photography. I start amateurs making money at home taking portraits; become professionals. Studio secrets, retouching, etc., fully explained. Wells' Studio, East Liverpool, Ohio.

MOTION PICTURES

EASY Payments—Moving Picture Machines, standard size. Others, $5 to $40, and all moving picture apparatus. Catalogues. Ralph J. Golsen, 65 East 46th St., Chicago.

EDISON exhibition moving picture machine; bargain for $75. L. Hoberdier, Market St., Canton, Ohio.

$25 TO $100 paid for Motion Picture Plots. Your ideas are valuable. Learn how to develop them under successful photoplaywright. Big demand. Catalogue and interesting particulars free. Authors' Motion Picture School, 1533K, First National Bank Bldg., Chicago.

EDISON Moving Picture Machine, 2 pin, 200 feet of film, $100. Will trade for motorcycle. J. J. Conway, 129 E. 10th St., Covington, Ky.

WRITE Moving Picture Plays; $10 to $100 each; all or spare time; experience or correspondence course unnecessary. Details free. Atlas Publishing Co., 304, Cincinnati, Ohio.

YOU can earn big money writing moving picture plays. Great demand. We teach only sure method. Send for free booklet of valuable information and special prize offer. Chicago Photoplaywright College, Box 278B.S., Chicago.

MOTION picture plays wanted. You can write them. We teach you by mail. No experience needed. Big demand and good pay. Details free. Ass'd M. P. Schools, 601 Sheridan Rd., Chicago.

FOR ADVERTISERS

YOUR 30 word ad in our 20-page postcard magazine 15c. Display 50c inch. Elite Exchange, 3827 N. 44th Court, Chicago.

TWENTY-FIVE word advertisement inserted 100 periodicals $1. Particulars 4c. Max Janes, Joplin, Missouri.

BARGAIN Advertising Rate—Just to get acquainted, 15 words, one insertion; guaranteed 13,000 copies, printed, and one year's subscription, 25c. Digest, Grand Rapids, Michigan.

SEVEN Line Ad in Star Magazine, year's subscription, 70c. 50,000 circulation. Levert Dolson, Hampton, Iowa.

YOUR ad placed in nearly fifty magazines, 3 months, 5 cts. per word. A. S. Mankin & Co., Alexandria, Va.

SANITARY Paper Drinking Cups—Samples upon request. Yarroll, New Britain, Conn.

I ORIGINATE and write Pulling Advertising Matter. Geo. R. Hoagland, 517 Main, Kansas City, Mo.

TO MANUFACTURERS

A MANUFACTURING concern with a large, completely equipped, up-to-date plant, is in a position to manufacture sheet metal specialties. These can be stamped, spun, welded or otherwise. Address The A. M. Co., 1420-26 W. Baltimore St., Baltimore, Md.

WE sell, transfer, demonstrate, collect. Have Auto, office, showroom. Box 25, Grand Forks, N. D.

BLACKSMITHS

BLACKSMITHS—Here is your opportunity to be an expert blacksmith without help as life is short. Try Toy's Modern Methods doing hard jobs easy. Forging and welding all kinds of steel solid, and tempering and hardening all tools to a standard by colored charts. This is real information, not theory. All for one dollar. Send for free samples. W. M. Toy, Sidney, Ohio.

BUSINESS OPPORTUNITIES

MAKE More Money! Operate a good, substantial Mail Order business—our "Silent Salesman" system—can easily be done in spare time yet the possibilities are unlimited! For years "Booster" has actually and accurately led thousands like you over the Successful Road to Wealth. To succeed you've got to read The Booster Magazine for "Booster" is Opportunity and starts you in business for yourself—tells you how to get the dollars—puts you next to the best money making propositions on earth—ones that really get You the money! Send 10c for two months' trial subscription. Booster Magazine, Northwestern Building, Chicago.

WE Start You In Business, furnishing everything; men and women, $30 to $200 weekly operating our "New System Specialty Candy Factories," home or small room anywhere; no canvassing. Opportunity lifetime; booklet free. W. Ragsdale Co., East Orange, N. J.

AMBITIOUS men, you want to make more money. Have plan by which you can double your earnings. No canvassing. Write for free booklet "Within Your Reach." M. Robinson, Box 2063, Montreal, Canada.

USE your spare time to build up a mail order business of your own. We help you start for a share in profits. 27 opportunities. Particulars free. Mutual Opportunities Exchange, Buffalo, N. Y.

DRAW life sentence manufacturing our list five products! 600 per cent profit! Few dollars starts. Costs, selling prices, selling points, how marketed, all told in detail. Fifty cents. Act quick. McArthur Mfg. Co., Dept. C., Church & Adelaide, Toronto.

SELL by mail—New patented specialties; factory prices; new selling plans; small capital. Spare time. Copyrighted prospectus and samples free. Mississippi Valley Co., Inc., Box M629, Pittsburg, Kans.

LESSONS in mail order business. Circular mailing, agents, schemes, plans and up to date information each month in our magazine. 10c copy. Three months, 25c. The "Lever" Mail Trader, 44, Elizabeth, New Jersey.

CONDUCT Employment Agency; business entirely new; enormous steady profits. Special offer. Particulars for stamp. Hilton, 49 Western Ave., Waterville, Maine.

FACTORY formula, one we use for resilvering mirrors, big money maker. Work can be done at home at spare time; full instructions, $1. Smith Furniture Co., St. Marys, Ohio.

AD Bargains—25 words in 100 monthlies, $1; 100 weeklies, $2. Life Co., St. Louis.

LEARN a light manufacturing business that pays $25 weekly in any locality. Particulars free. B. H. Elkins, Farmington, New Hampshire.

LEARN painting portraits on glass. Complete printed instructions, 25 cents. Schleier Co., 1524 Lula, Box 482, Wellston, Mo.

LET the Parcels Post Help You. Add ($15 to $25 weekly) to your present salary or income. Start during spare time and build up a permanent mail-order business of your own. We show you how and help you make good. No canvassing. Experience unnecessary. The Parcels Post makes success doubly sure. Our new ideas and up-to-date plans bring the money. No so-called "Course of Instruction" to sell. We give that free. Write today. Address Pease Mfg. Co., Inc., Dept A, 70 Broadway, Buffalo, N. Y.

YES, It's a new one, never advertised before. A beer coil cleaner that works like shot in a bottle. Build routes cleaning coils at 25c each. We lease you machine with exclusive territory. Weighs 15 lbs. Sand Blast Beer Pipe Cleaner Co., 312 Madison St., Chicago, Ill.

SELL your formulas, ideas, plans and knowledge by mail. Some make $1,000 monthly. Instructive booklet for stamp. Information System, 292 Marietta, Ohio.

YOU can make $10 to $20 a day in ice cream cone business. Outfit and formulas $8.50. Particulars free. U. S. Specialty Co., Dept. 39, New Philadelphia, Ohio.

BE Prosperous. Go into the Real Estate Business. Great opportunities now. Make Big Money without capital. We'll train you. Free Book—How To Win. Represent us. American Realty League, San Francisco.

START a Wall Paper Cleaning Business or manage a shop for me. Material furnished; profits half; write today. Million Co., Davenport, Ia.

WE Sell Patents. Established 1900. If you wish to add a new product to your line, write us. Charles A. Scott Co., 1000 Granite Bldg., Rochester, N. Y.

WILL Furnish Model, and assign reasonable, the county rights to manufacture an efficient outdoor Fly-catching Device. Agents wanted. D. J. Spangler, Elkhart, Ind.

FORM a corporation—Congress Law for D. C. and all States, cheap. Raise money easily. U. S. Legal Corporation, Washington, D. C., representing $1,225,000,000.

I MAKE $5 a day in the "Handy Man" business. Particulars. Houlgate, The Handy Man, 1010 Cypress Ave., Pasadena, Cal.

$40 WEEKLY, manufacturing postcards. Easy to learn. No fake. Send stamp. Grandon, Jackson, Mich.

INCREASE your income without capital. No fake, mail order or canvassing scheme. Descriptive circular free. Box 1301, Vermillion, S. Dak.

START your own business; Big Money. New plan. Particulars free. Write now. Box 193, Norwich, N. Y.

MAIL Order Business. I start you free. P. Newnham, Waukegan, Ill.

DON'T start in Mail Order Business until you get our plan. Box 2792 Boston, Mass.

LET me start you in the mail order business anywhere. I started with an idea and $100.00 and made six hundred and fifty thousand dollars in 18 months. I tell you what to do and how to do it. Don't be a wage slave; get out of the rut; get grit; get backbone; wake up and start now. Write and learn of my money-making mail order plans. My great free book, "How to Achieve Mail Order Success," tells all about my own achievements and how I equip, teach and get you started. This book tells how to quickly start in your home, while otherwise employed. It is a B line to a large income. Send for my new free book and start making money now. Address President, Mail Order School, Suite 1167 Brecht Bldg., Denver, Colo.

STOP: Investigate at once: New business: No experience: 500% profit making photos with the new One Minute Post Card Camera. Takes and delivers finished post card photos in one minute right on the spot. No plates, films or dark room. Make big money everywhere, traveling or at home. This is your opportunity for immediate and permanent success. Don't delay! Write today for free information. The One Minute Camera Co., Dept. 72, Rand McNally Bldg., Chicago.

SMALL Investors Opportunity—$2 to $10 invested monthly will mean much to you in future. Limited number of shares insured by bank to pay well. Profits great with probably unprecedented surety. We own 15,000 acres. Ask for information. Swastika Sheep and Land Co., 611 S. Bdwy., Albuquerque, N. M.

START a Candy Kitchen. Big money. Best course of instruction ever originated, complete 50c. Profitable Service Bureau, 4333 N. Sawyer Ave., Chicago.

ENCYCLOPEDIA of Business Chances. Money making methods exposed; how small ventures lead to wealth; 2000 trade secrets, etc. Descriptive booklet free. Reinel & Co., 96 Broadway, N. Y.

$1.00 RESILVERING Mirror Formula, and year's subscription to our 20 page postcard magazine 40c. Elite Exchange, C3, 3827 N. 44th Ct., Chicago.

INCORPORATE your business under Arizona laws. Cost small. No franchise tax. Stockholders exempt from corporate debts. Do business anywhere. Laws and forms free. Southwestern Securities & Investment Company, Box D488, Phoenix, Arizona.

500% PROFIT, making the new "Blackboard" advertising slides for moving picture theatres. Complete instructions and material, 25 cents. William A. Temple, Fort Dodge, Iowa.

WE help raise capital at once to start you in retail—manufacturing—patent—real estate—mail order or any legitimate business by means of "Our Practical Method." Particulars free. The Business Aid Co., K584, Detroit, Mich.

MAMMOTH mail order magazine 10c. C. White, Publisher, Hazlehurst, Miss.

EARN $5.00 during spare time. Experience or capital unnecessary. Samples and full particulars for stamp. Miller Sales Co., Dept. B., Lexington, Ky.

PATENTABLE ideas wanted—Send for 3 free books. Richard B. Owen, 30 Owen Bldg., Washington, D. C.

I MADE $50,000 in five years with a small mail order business; began with $5. Send for free booklet. Tells how. Heacock, 5674 Lockport, N. Y.

AN intelligent person may earn $100 monthly corresponding for newspapers. No canvassing. Send for particulars. Press Syndicate, 700 Lockport, N. Y.

TRIAL Offer: $1 places your 25 word ad in 200 different magazines. Send copy now. King's Magazine, Box 13P, Little Silver, N. J.

RESILVER mirrors and make plenty of money. Full instructions, 25 cents. Auburn Supply Co., Dept. CC, 7746 Peoria St., Chicago.

"THE Art and Process of Dry Cleaning." A fascinating and profitable occupation. 25 cents postpaid. Auburn Supply Co., Dept. EE, 7746 Peoria St., Chicago.

AGENTS—A big new moneymaking proposition. Write today. Williams-Crosby Co., 2728 Wabash Ave., Chicago.

WE start you in a permanent business with us and furnish everything. We have new, easy selling plans and seasonable leaders in the Mail Order line to keep factories busy. No canvassing. Small capital. Large profits. Spare time only required; personal assistance. Write today for (copyrighted) plans, positive proof and sworn statements. J. M. Pease Mfg. Company, 541 Pease Bldg., Main Street, Buffalo, N. Y.

BIG Money in the Mail Order Business. Experience unnecessary. Small capital. Instructions free. Keith, 719 Central Bldg., Rochester, N. Y.

MAIL Order Dealers! Advertisers! You need our 1913 Advertising Rate Book with the latest Dollar-making feature "Ads That Pay." Hot from the press! Gives you cost of Advertising in 2000 recognized magazines and newspapers, location, circulation, closing dates and other useful knowledge. Includes thirty original Mail Order propositions, winners every one of them. A $10,000 investment at your service. You can make a legitimate profit of 95c on every dollar order. This very valuable manual sent prepaid to you for 10c. Write now! Dearborn Advertising Agency, 521 Dearborn St. Chicago.

A Bit Shy on Salary? I pick up $1,500 yearly additional from newspaper correspondence. My book tells what's news, how to get it, where to sell. Newspaper directory included. No correspondence school expense; only 50 cents. Morris White, Station, 50, Detroit, Mich.

INDEPENDENCE and fortune quickly attained in the Manufacturing Mail Order business. I furnish Formulas, Manufacturing Processes and Trade Secrets in all lines. Sold under positive guarantee; 18 years' practical experience. Revision and improvement of Formulas and Processes—reduction of manufacturing cost—utilization of waste materials, etc., a specialty. Booklet, Formula List, and Valuable Information Free. W. L. Cummings, Ph. D., 127 Standard St., Syracuse, N. Y.

BIG Profits for You! Manufacture Barley Crisp. New confection. 5c package costs you 1c. Machine, instructions complete $7.50 prepaid. Send 10c for samples. Barley Crisp Co., 1605 Hyde St., San Francisco.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything and guarantee success. Send for proofs. Voorhies, Desk C. R., Omaha, Neb.

I WILL start you earning $4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operations. G. F. Redmond, Dept. 306, Boston, Mass.

MANUFACTURE Gold Letters for signs—$100 per month easy. I start you. Experience unnecessary. Take like wildfire. Prospectus free. J. F. McPherson, 673 Brown Avenue, Butler, Pa.

COLLECT money by a sure, simple, system. Income $1,000 to $5,000 a year. Quick results. No capital required. Instructive book, "Skillful Collecting," free. National Collectors Ass'n., Long Street Newark, Ohio.

AGENTS WANTED

BE an Ind-Electric Representative. You can make anywhere from $50 to $150 a week selling the Ind-Electric Health and Beauty Battery—one of the most remarkable inventions of the decade—a device for which there is a market in every home in America. Our representatives are making this much right now—a few make more. You can do the same if you are the right man or the right woman. No special experience necessary. We coach you—tell you of the methods others have used to succeed. With perseverance and enthusiasm you may do as well as our "top-notchers," who are making dandy incomes. We give exclusive territory and let you organize your own subagents. Territory being closed rapidly. Write at once to the Ind-Electric Mfg. Co., Desk 19, 432 Peoples Gas Building, Chicago. Capitalization, $100,000.

GENERAL Agents—Capable of calling on the big trade themselves and handling canvassers for the house to house and office to office business, to sell the newest electric specialty on the market; sold everywhere there is electricity in the home, office, factory, store, hotel, liberal profits; sales-driving sample, weighs a pound; no experience or knowledge of electricity required; shows how to use one light instead of two and get the same results; sells for $2.50, $3.50, $5 and saves the purchaser an investment of $25. Write for particulars. The Handy Light Co., 153 Handy Light Block, Cincinnati, Ohio.

MAKE $8 to $10 a day with the Bissell Electric Suction Cleaner. Men who can quickly clean a whole house, rugs, carpets, bedding, upholstering, get big pay. If you are making only $2 or even $3 per day, you can make three times that with a Bissell cleaner. Let it pay for itself out of a part of the profits; you keep the rest. Works fast, earns $1 per hour. Easy terms to you. Build your own business on our money, and you can also make a commission on sales. Ask us. The Bissell Motor Co., Toledo, Ohio.

MAN Wanted as Exclusive Agent. We manufacture six styles Self-wringing Mops, for all purposes, including an absolutely new combination Scrubbing Brush Mop that is Self-wringing. Every woman wants this proven success. New inexperienced men make $9.00 per day. One man made $120 the second week. No investment. Send for catalogue and exclusive territory proposition that will make you independent. Hilker Mop Co., 1219 Grand Ave., Chicago, Ill.

AGENTS. Look into this Money Proposition. It's a good live repeat seller for every house. Unlimited field. You don't have to talk your head off. Free sample. J. F. Jordan Mfg. Co., 417 Niagara St., Niagara Falls, N. Y.

PORTRAIT agents find our plan beats all others. Prompt shipments—rejects credited. 30 days' Credit. Catalogue of Portraits, Frames, Pillow Tops, Sheet Pictures and samples free. James C. Bailey & Co., Desk D, Chicago.

AGENTS Wanted—We want a live man in every town to act as a sales manager. We want you in your town. Devote your spare time to our business and you will make bigger money than you ever made before. Give us all your time and we will make you rich. These are facts, not promises. $50 a week at the start. Besides, a nobby free suit—and all the clothes you want at less than wholesale price. Wear one of our free suits as an advertisement and people will flock to you to buy a suit like it and you will coin money. Get our money making proposition and beautiful book of samples. Just send a postal card. We pay express charges on everything. Join the live wires—send us a postal today. Paragon Tailoring Co., Dept. 414, Chicago.

$50 A MONTH earned at your own home! No canvassing or collecting required. All our work may be done in any room of the house in spare time without interfering with your regular duties and without your nearest neighbor knowing you work for us. New system of business and the greatest offer ever made. Write now before it is too late! Blye & Co., Dept. 31, Terre Haute, Indiana.

YOUNG man, would you accept and wear a fine tailor-made suit just for showing it to your friends? Or a Slip-on Raincoat Free? Could you use $5 a day for a little spare time? Perhaps we can offer you a steady job. If you live in a town smaller than 10,000, write at once and get beautiful samples, styles and this wonderful offer. Banner Tailoring Company, Dept. 202, Chicago.

AGENTS Wanted—Here's big money for you—and a stylish nobby suit absolutely free. $40 a week easy. Many are making more. Nothing to learn. Nothing to buy. Nothing to invest. No capital required. We furnish everything free—even the suit of stylish clothes you wear. Our men are the swell dressers and it don't cost them a cent, and they make big money every week. Get in now. Now is the time for the big money. Your name on a postal brings everything free. The handsomest lot of samples of the latest suitings you ever looked at to choose your suit from. And a book of fashion plates showing the very latest, nifty, nobby styles; also measuring blanks and everything needed—all free. We pay expressage on everything. Send that postal now—don't wait. This is your chance—grasp it. American Woolen Mills Co., Dept. 414 Chicago.

WANT three swell made-to-measure shirts? Show our samples to friends, take a few orders easy and make enough profit to get yours free. New fancy patterns, made just as you want them. One good agent wanted in each town, spare time or all time. Write for beautiful samples, wholesale and retail prices and our liberal offer. Peerless Shirt Makers, Dept. 15, Chicago.

MANUFACTURERS' agents take notice. If the family tooth powder (the greatest tooth cleaning preparation in the world) is not represented in your county, here is a valuable agency or side line. A big seller and a repeater. Write for proposition. J. M. Forrest, MD. DDS., 3287 Mission St., San Francisco, Cal.

AGENTS—"Border Wars of Texas," a book of 400 pages of thrilling accounts of Indian raids, battles, etc.; 40 full page illustrations portraiting the cruel hardships of the Texas pioneer. It is a quick seller for agents. Sent postpaid for $1.50 cloth, $2.00 morocco, or terms, etc., for stamp. Matt Bradley, Tioga, Texas.

SALESMEN—Our Press Button Automatic Opener Pocket Knife, the very newest out. Our sales cards sell them quickly for the dealer at a good profit. Fine side line, 80c brings sample knife and card. Knife Guaranteed is worth $1.50, money back if not satisfied. Act quick. Unique Novelty Co., Independence, Iowa.

BE quick—get the agency—never such a seller—make $100.00 a week. Model Vacuum Cleaner—carpet sweeper type—wonderful suction—your profit over 100 per cent—no competition—patented—we start you—the cleaner sells itself—free sample to workers. Braham Co., D40, Cincinnati, O.

CHEWING Gum—Sell to dealers. Clean, profitable business built up quickly with our new brands. Four flavors, novel packages. Send 10c for full pack of each and exclusive territory proposition. Helmet Gum Factory, 39 Opera Place, Cincinnati, O.

WANTED—Ambitious, hustling, town or country man. In each locality. Who desires to get ahead and earn more. Part or whole time. Fine chance—Experience not needed. Write quick for Cash-Bonus offer. Box 9C, 292, Covington, Ky.

BIG opportunity for the right man in your town. Exclusive control—something new—legitimate—no canvassing—small capital required—give references. Drawer 165, New Haven, Conn.

AGENTS on salary or commission. The greatest agents' seller ever produced; every user of pen and ink buys it on sight; 200 to 500 per cent profit; one agent's sales amounted to $620 in six days; another $32 in two hours. Monroe Mfg. Co. X., 60 La Crosse, Wis.

AGENTS—A cent sent Swank tells about free offer and how to sell greatest discovery of the age in homes, stores, factories, offices. Easiest seller; out Nov. 29, 1912. Biggest profits. A. H. Swank Mfg. Co., Fremont, O., Dept. 19. Toronto, Canada Branch, 226 Shaw St.

AGENTS make big money selling our new gold letters for office windows, store fronts and glass signs. Any one can put them on. Write today for free sample and full particulars. Metallic Sign Letter Co., 406 N. Clark St., Chicago.

WE are the largest manufacturers of Twisted Wire Brushes in America. Highest grade goods, best service, highest profit. Write for our new catalog. You are sure to win. Fuller Brush Co., 33 Hoadley Place, Hartford, Conn.

HAVE you a few hours to spare? We want man or woman in each town. No capital needed. An hour's work shows dollars earned in spare time. Pocket sample. 400% profit. G. C. Mfg. Co., (Dept. 104), 20 Warren St., N. Y.

$1,000 EARNED by three people within thirty days selling our Fire Extinguishers. Buyers everywhere, protected territory, 500% profit. Local and State Agents wanted. United Manufacturing Company, 1025 Jefferson, Toledo, Ohio.

MILK Tester "Inspector" shows immediately if milk is pure or how much water is added. Utmost practical article. Retails 50c; big profits. Specialties Co., 672 Eagle Ave., New York, N. Y.

AGENTS—Get particulars of one of the best paying propositions ever put on the market. Something no one else sells. Make $4,000 yearly. Send postal today for particulars. E. M. Feltman, Sales Mngr., 6178 Sycamore St., Cincinnati, O.

WHEN you sell Feeny Vacuum Cleaners you deliver the goods. New principle—creates wonderful suction. One general agent's total commissions 1912 was $18,498.00. Write today for our attractive proposition. Feeny Mfg. Co., A28, Muncie, Ind.

AGENTS: Do you need a license? The Agent's Protector proves it. 100 pages. Every live agent should have a copy. Price 25c. Kay Company, 401 E. 5th St., South Boston, Mass.

AGENTS—100% profit—sell to saloons—machine a whirlwind seller. Free sample and salesmanship course. Two sales a day $15 profit. Write. Simplex Mfg. Co., Dept. 7, Kewanee, Ill.

AGENTS—Our Electric Rug and Carpet Cleaner positively makes old rugs and carpets look like new, cleans everything, sells in every home. Sample prepaid 25c, write today. Electric Sales Co., Indianapolis, Ind.

AGENTS—New invention, Aluminum Cigar Lighter. Used on cigar cases. Quick seller to Hotels, Drugstores, Restaurants, Poolhalls, Cafes. Big profits. Special offer. Drake Mfg. Co., 142 Reed St., Milwaukee, Wis.

AGENTS make 500% profit selling our gold window letters, novelty signs and changeable signs. 800 varieties in enormous demand. Catalogue free. Sullivan Co., 1238 Van Buren St., Chicago, Ill.

SELLING Agents Wanted for "Fire Out." Best selling small fire extinguisher. A real money maker for you. Our proposition won't disappoint you. The Inst. Lighter Co., Dept. M., Columbus, O.

AGENTS—New article, record breaking sales everywhere. Write for free sample and new catalogue. Kay Company, 401 E. 5th St., South Boston, Mass.

MAKE and sell your own goods. Formulas by expert chemists. We obtain your government serial number. Catalogue for stamp. B. Mystic Company, Washington, D. C.

AGENTS wanted for "Healo" the toilet preparation for preventing all forms of excessive perspiration. Big money. Start now. Particulars free. Health Medicine Co., Dixon, Ill.

I MADE $50,000 in five years with a Small Mail Order Business; began with $5. Send for free booklet. Tells how. Hancock, 146 Charles St., Lockport, N. Y.

U-KAN-PLATE—The polish that plates; $18-$40 week year round; exclusive field; free booklet. C. B. Seabury, L465, Boonton, N. J.

AGENTS—We have a proposition worth $40 to $60 a week to you with no competition. Galloway-Bowman, Div. No. 309, Waterloo, Iowa.

400% PROFIT selling our high grade work. Samples free. Gordon Co., Northwestern Bldg., Chicago.

AGENTS—Latest and best novelty wanted in every home, send 25 cents for sample. A. Wood Novelty Co., Box 656, Portland, Oregon.

MEN—Women. All towns. Sell greatest moneymaker. Big pay. Credit allowed. Sample free. Horner Manufacturing, 524 Pittsburgh, Pennsylvania.

SIGN Agents—Painters—Something new and better. Attracto ready-made Gold and Silver letters. 21 kinds, easily applied. Make big money lettering store windows, making signs, and selling our line of flashing, sparkling chipped glass name-plates. No experience needed. Write for sample letter and catalogue and start at once. Address Attracto Sign Co., 2655 North Clark Street, Chicago, or 519 Pacific Bldg., San Francisco.

SALESMEN Wanted, best seller on market, 200% profit. Liverslige, Newburyport, Mass.

YOU can make more money operating a mail business, but before taking any chances invest 10c for two samples of "Booster"—the one bonafide Mail Order and Agents' publication on earth—a magazine that has for years actually and accurately started others like you in business for themselves by publishing the best money making propositions on earth—ones that really get You the money! Send 10c today—it's worth dollars to you. Booster Magazine, Northwestern Building, Chicago.

$61.50 WEEKLY introducing and selling a new Gas Light Burner for Kerosene Lamps. Beautiful light. No chimney. No mantle. Perfectly safe. Simple in construction. Nothing to get broken or out of order. Will not burn out. Durable. Will last for years. Low price. Easy to sell. 200 per cent profit. Experience not necessary. Sample free. Why not try one on your lamp? Beware of imitations. No branch offices. Luther Manufacturing Co., Dept. 223, Cincinnati, Ohio.

AGENTS make $5.00 to $10.00 a day on the start. Atkinson writes: "The best proposition I have found in my forty years canvassing." Permanent work. Household necessity. Saving 80%. Write to-day for General or Local Agents terms. Free sample. C. H. Stuart & Co., 16 Union St., Newark, New York.

AGENTS—$200 monthly distributing Newells needle cases. Sell 115 needles in book for 10c and make 200% profit. Approval Plan envelopes make talking unnecessary. Crew Managers write. Send 10c for sample book and particulars. Newell Company, 509 N. Grand, St. Louis, Mo.

SECURE territory now for Gravity Spiral Hinge. Sample 50c postpaid, deducted from first order. Agents making $10 daily. Hoosier Hinge Co., Goshen, Ind.

AGENTS—$60 weekly premiums easily made. Write for free particulars and samples today. 100% profit besides premiums. No money required. Lloyd Company, 242 De Balivere, St. Louis, Mo.

SELL by mail—New patented specialties; factory prices; new selling plans; small capital. Spare time; copyrighted prospectus and samples free. Mississippi Valley Co., Inc., Box N629, Pittsburg, Kans.

AGENTS—Made five days' test spare time, cleared thirty dollars; you can do same. Send for particulars today. Stewart Specialty Company, Columbus, Ohio.

SOMETHING new. Sanitary Parawax Folding Drinking Cups; postpaid, 10c, 3 for 25c. Niagara Falls Novelty Co., Box 765, Niagara Falls, N. Y.

MAKE $20 daily operating our Minute Picture Machines. Experience unnecessary. Small investment; large profit. Free book, testimonials, etc. Write American Minute Photo Co., Dept. E395, Chicago, Ill.

AGENTS—Make $10 per day selling wonderful lock-stitch-awl-hand-sewing-machine. 100% profit. Sells itself. Send 50c for $1 sample. W. A. MacKenzie, 268 De Balivere, St. Louis, Mo.

AGENTS and salesmen will secure free, complete information of numerous money making selling propositions and newest specialties in hands of responsible concerns by addressing Distributor, R-13-26 Cedar St., New York.

AGENTS—$15.00 per day, selling new portable desk lamp and other electric fixtures. Write for special offer. Runkel Manufacturing Company, Milwaukee, Wis.

HOSIERY; knit ties; sample free. Sutton sold twelve dozen in one week besides hosiery, 100% profit; appoint sub-agents, develop permanent profitable business. Colby Hosiery Co., Second and Diamond, Philadelphia, Pennsylvania.

AGENTS wanted quick. Clean legitimate money-making proposition. No space for explanations. Write for full particulars and exclusive territory. Krueger Mfg. Co., Dept. 2A, 167 W. Washington, Chicago.

MAIL Order Opportunities; 25 new propositions. No competition! Make 95c profit on dollar order. Complete outfit, 10c. Mail Dealers Wholesale House, 447 Franklin, Bldg., Chicago.

AGENTS—"Art Match Scratchers." Sell everywhere. New, novel, attractive. Proposition and sample 10c coin. C. Leberman, Box 521, Tiffin, Ohio.

NAME on Rubber Stamp, 15c; with address, 25c. National Stamp Works, 42 N. Fifth Ave., Chicago. Catalogue.

"I'LL Take a Box." Agents, sell a staple necessity and hear this every few minutes. Big money. Particulars free. Write a postal now, and mail to C. S. Mason, Westboro, Mass.

AGENTS—Save time and money. Your name in our syndicate magazine directory will bring you big mail and the best offers from dealers and manufacturers. Special service. Three issues, 25c. Results guaranteed. Copy of our magazine, 10c. The "Lever" Mail Trader, 44, Elizabeth, N. J.

AGENTS—Make big money this spring cleaning wall paper; also cleaning carpets on the floor without taking them up. Formulas and complete instructions for doing both for dime. Box 134-A, Newport, Ky.

FOR sewing leather, the speedy stitcher. 50c postpaid. Agents wanted. Boyd Sales Co., Kingsessing Sta., Philadelphia, Pa.

TUNGSTEN Flash Light, nickel plated, vest pocket size 75c postpaid. Catalog. Boyd Sales Co., Philadelphia, Pa.

MONEY making business for high grade agents, selling our Sick-Call Outfit to Catholic Families. Write for details. Frank Schilling Co., Navarre, Ohio.

SALESMEN wanted for the Help-a-phone. Every telephone user needs one. Sells for $3. Salesmen's profit, $100 a week and up. Send for complete set instructions in salesmanship free. Wolverton Specialty Co., Massillon, Ohio.

AGENTS—Get busy with new device every automobile owner needs. Liberal commission. Sells on sight. Particulars free. F. Dunlap, Route 4, Hilliards, Ohio.

HAT Mirror with your name on. Latest craze; sample 10c. T. Sullivan, 100 Abbott Ave., Fitchburg, Mass.

READ the Agents Magazine. Make more money. 2 months, 10c. Agents Magazine, Chicago.

SELL three things for Washing, Ironing, Bluing. Interests every housewife. Samples 10c. Three full packages, 25c. Particulars free. Leibman, 720 Lefferts, Richmond Hill, New York.

POPULAR Show Card Co., Dept. APR, 1235 Michigan Ave., Chicago. Please hurry forward free two-color catalog. Yours for business.

$2.50 PER day paid one man or woman in each town to distribute free circulars and take orders for concentrated flavoring in tubes. Permanent position. J. S. Ziegler Co., 443-D, Dearborn St., Chicago.

SUCCESSFUL Brains. The Open Door of Opportunity. Brand new book. Full of money-making trade secrets and valuable information. Alvin Hambel, 3635 Armitage Ave., Chicago.

AGENTS Wanted. Send 35c for Tube of Water Proof Shoe Polish in Case with Dauber and Polisher complete, and one of each of our Catalogues and Agent's terms. A. S. Mankin & Co., Alexandria, Va.

CASH for names, addresses, information, etc. Steady income at home. Instructive booklet for stamp. Information System, 293 Marietta, Ohio.

AGENTS. If you don't make $4 profit the first day selling Tate's Guaranteed Dust Absorbing cloths, brushes, mops, etc., return sample outfit. Many agents make $25. Write quick for particulars. Dept. A-4, Consumers Direct Supply Co., Boston, Mass.

AGENTS who are looking for a permanent agency, we make no foolish boasts. By taking our line of men's tailored to order suits at wholesale prices you will have a permanent business, that will grow year after year. This is no one suit proposition. We do not urge you to buy a suit for yourself. We want you to sell them. No experience needed to make a success. Our $16.50 Suits as good as others at $25. Send your name and address to Highland Tailoring Co., Cincinnati, Ohio.

SIGN Agents—Stop paying fancy prices for Gold and Silver Metallic Sign Letters. Note ours: 2-inch letters, 70c; 3-inch, 80c; 4½-inch, 90c per 100. Non-tarnishable, staple goods. 5 assorted samples and instructions, 10c. Particulars free. H. Alexander, manufacturer, 328 East 59th St., New York. Established 1905.

AGENTS $10 to $15 per day easily made; 150% profit; exclusive territory; our cleaning polishing and dustless mop is the big money getter and record breaker. Duncan Bros., 2910 N. Troy St., Chicago.

"CREASE-EM" keeps trousers pressed two months. No trouble to apply. Will not injure the cloth. Liberal size package, 10c. "Crease-Em" Co., Chicago. Agents wanted.

SIGN Agents, Painters, 500% profit with our splendid line guaranteed non-tarnishable gold sign letters, trade emblems make-up-yourself aluminum door plates. Catalogue samples free. Eastern Specialty Co., Dept. 5, 63 Barclay St., N. Y.

AGENTS, something new, big success. LatherKreem, no cup, no brush, no soap, no lather, just apply and shave. Exclusive territory, write quick, send twenty-five cents for sample. Mory & Thorn, Dept. "C," 260 West Broadway, New York.

WANTED Hustling Agents, not afraid to make Big Money. Absolute necessity in every home, shop and factory. Sells 75c, your profit, 45c. Another sells $1.50, your profit 85c. 250,000 sold in Chicago alone. Exclusive territory. Frederick, 2255 State St., Chicago.

AGENTS Wanted—Parcels Post Maps, and booklets. Good profits. Sample, fifty cents. E. R. Bogart, Station C, Buffalo, N. Y.

BURGLAR Proof Door Fasteners, attached instantly to any door without tools. Cannot be picked. Sample and particulars, 25c silver. Burglar Proof Lock Company, 435 River St., Dayton, Ohio.

VACUUM Cleaner agents wanted everywhere. Most powerful Double-Suction Cleaner made, guaranteed 5 years. Best yet. Rev. Waterman, of Iowa, without experience, made $234 in 5 days. Postal card brings proposition. Warner Vacuum Cleaner Co., Box Z, Muncie, Ind.

SALESMEN—Send your name and address to Raymond E. Wood, 117 Dreyer Bldg., Cincinnati, Ohio. I am the manufacturer's Sales Manager for the best household and office electric specialty ever invented. Sells for $3.50 and $2.50. Guarantee for credit or deposit required. Capable men only need apply. I want only a few men. The work is permanent, profitable and high-grade. You will be given territory and expected to produce business.

"EVER Ready" trousers pressers work while you sleep; no heat, no expense, simple, practical and convenient; crease and press perfectly. New invention. Price, $2. Liberal commission to agents. H. O. Stamp & Co., 622 Third St., Milwaukee, Wis.

AGENTS to sell soaps, perfumes and toilet articles, good profits. Hopfinger & Roth, 219 N. 2d St., St. Louis, Mo.

EXCELLENT opportunity for salesmen to sell our Magic Weeders and Hoes, the king of garden tools, to stores or house to house. Excellent exclusive or side line. Exclusive territory. Sample 35c prepaid. Reichard Mfg. Co., Bangor, Penna.

LIVE agents everywhere; big proposition; big profits; absolutely needed wherever water or steam pipes used; no capital required. Fullest protection. Postal brings particulars. Patterson-Allen Engineering Co., Dept. A, New York.

SALESMEN paid $108 weekly salary. Sell Help-a-phone. Instruction in salesmanship free. Also distributors wanted at $4 daily. Write quick. Harper Specialty Co., St. Marys, W. Va.

LIVE agents, Male and Female, looking for first-class proposition send for particulars, LeRoy Specialty Co., 76 Park Place, N. Y., Room 52.

AGENTS to take orders for visiting and business cards of distinction. Folder P free. Forman Printery, Waterbury, Conn.

MAIL Dealers, Agents. Twenty new, practical, exclusive specialties. Moneymaking plans and circulars free. Columbia Mfg. Co., 1557 Wells St., Chicago.

SELL and install our No-Battery Electric Bells at big profit. $5 to $10 a day. Expert knowledge not necessary. We can help you start a big profitable business. Write for terms. Searles Electric Co., 1154C Monadnock Block, Chicago.

IF you want the best agency proposition ever offered wide awake canvassers write us at once; exclusive territory. The Wabash Pottery, Roseville, Ohio.

AGENTS. Our great Luminous picture, Rock of Ages. Wonderful, mysterious; cross shines brilliantly in darkest room. Sample 25c prepaid. Exclusive territory. Big profits. Pioneer Portrait Co., 1242 W. 63rd St., Chicago.

WRITES with Water. Helios Pocket Pen with compressed ink. Regular price 25c. Sample to agents 10c. Wm. Muller, U. S. Sole Agent, Security Bldg., San Francisco.

HOME Manufacturing—Pleasant and profitable business quickly established during spare time. Product international necessity. Write for particulars. Delzell Mfg. Company, Desk A, 448 South Mathews, Los Angeles, Cal.

$20-$40 WEEKLY selling Hosiery, Underwear, Sweaters, Neckties. Liberal commissions; samples free. Sales Manager, Room 69, 54 Worth St., New York.

WANTED—People to travel and put out advertising. Write today. P. Breeden, Box 938, Norfolk, Va.

AGENTS to sell the newest electric appliance on the market; sold everywhere there is electricity in the home and office; liberal profits; sales-driving sample, weighs a pound, no experience or knowledge of electricity required; it shows how to use one light instead of two and get the same results; sells for $3.50 and saves the purchaser an investment of $25; write for particulars. The Handy Light Co., 15 Handy Light Block, Cincinnati, Ohio.

EARN $20 to $50 weekly mailing circulars. Anyone, anywhere, spare time. Full instructions, two dimes. F. J. Smith, Box 472D, Waterloo, Iowa.

GOOD Mechanics to use and sell graduated Calipers, Whichway Levels. Paying proposition. Ernest Smith, Columbia, Pa.

AGENTS in every city and town can double their income selling low-priced, tailored-to-order raincoats of the finest kind. Write for samples, free raincoat offer and exclusive territory. English Raincoat Tailors Ltd., 500 Fifth Ave., N. Y.

500% PROFIT selling our wonderful sign letters for office windows, store fronts and glass signs; resembles finest gold leaf; easily applied; samples free. Metallic Letter Co., 406 N. Clark St., Chicago.

REMNANT Store, 1331 E. Linn, Cincinnati. Greatest Dry Goods Bargains on Earth. Proposition to agents and storekeepers.

AGENTS—$10 per day sure selling our New 1913 Styles Silk Neckwear. 3 fifty-cent ties $1. Monogram Gold Cuff Link and Stick Pin Set given Free. Cooper made 75 sales in 7½ hrs. Profit $30. Free Samples to hustlers. Dayton Neckwear Mfg. Co., Dept I, Dayton, O.

SIDE Line salesmen and specialty men wanted. Japanese Novelty Co., Clinton, Ia.

AGENTS make $30.00 weekly selling our 500 Handy Household Articles; catalogue free. Scheff Company, Desplaines, Ill.

MEDALLIONS—300% profit. Make up your own goods and be independent. Catalogue free. Resag Co., 1205 Randolph St., Chicago.

EARN $15 to $25 a week or more as our Mail Order Dealer. Right from your own home. Hold your position until entire time is required. We are manufacturers and owners of Patented just-in-season specialties. If you are just starting a Mail Order business or if already established, you can't afford not to handle our Patented Money making getters. We sell exclusively to our Mail Order Dealers. We protect them. We carry stock and furnish everything. No canvassing. Small capital. Experience unnecessary. Write today for latest patented leader and manufacturer's easy selling Mail Order (copyrighted) plan backed up by "Whole Truth," positive proof and sworn statement. J. M. Pease Mfg. Co., 539 Pease Bldg., Main St., Buffalo, N. Y.

SOAP agents make more money selling the celebrated Linro line. Coffee, flavorings, spices, soaps, perfumes, and 135 other items. Big commissions to you. Exclusive territory. Freight allowed. Handsome premiums to your customers. Free sample case. No deposit required. Free catalog. Linro Company, 13 Linro Bldg., St. Louis, Mo.

AGENTS sell rich looking imported 36x68 rugs $1 each. Carter, Tenn., sold 115 in four days, his profit $57. You can do as well. Write for sample offer and selling plan. Sample rug by Parcel Post prepaid 98c. A. Condon, Importer, Stonington, Maine.

AGENTS—Would you take a steady job where you can clear $20 to $30 weekly and work up to yearly profits of $3,000 or more. My line is snappy household goods. Quick sellers. Get busy with postal asking particulars. E. M. Davis, B17 Davis Blk., Chicago.

BIG Seller. Side line or agents. Johnston, Newport, R. I.

WANTED immediately agents to sell our high grade rebuilt typewriters, also ribbons and carbons; over 100% profit. Send for large illustrated catalogue and special agents offer. Harlem Typewriter Exchange, Agency Dept. 215 West 125th St., New York City.

KEY Checks—$1.45 per 100. Dies for stamping names on checks, fobs, umbrella plates. Wholesale prices—Collar clips, sewing awls, etc. We show you how to make $5 per day. Pease Die Works, Dept. M., Winchester, N. H.

MAKE $21 next Saturday. Sell startling new invention—just out. Combination Burner and Filler for all Coal Oil Lamps. Unbreakable steel mantle. Big white powerful light. No smoke or smell. Fills Lamps quick. No dirty hands— no slopping oil. Low in price—selling like wildfire. Agents coining money. Johnson, Fla., cleared $40 first week. Hess, Iowa, made $7 one day. Exclusive territory and protection free. Not sold in stores. Send no money but write quick for details. Fairchild Co., 512 Nasby Bldg., Toledo, Ohio.

AGENTS—My Twelve "Money makers" bring repeat orders. Easy selling plans. Big profits. A. Rolfe, 923 N. Alder, Philadelphia, Pa.

SELLING our exclusive linen heel and toe guaranteed hosiery direct from mill to wearer. Pays big profits. Customers waiting. Re-orders insure permanent, increasing income. Exclusive territory. Credit. N. Parker Mills, 720 Chestnut St., Phila., Pa.

AGENTS—County and State; men and women everywhere to sell the Pinless Clothes Line; a practical labor saving invention, lasts life-time, sells on sight, gives perfect satisfaction. Agent Sutton of Georgia, sold over million feet; 100% profit; write quick for exclusive territory; information free; sample prepaid 25c stamps. Pinless Clothes Line Company, 520 Wilcox Bldg., Portland, Oregon.

AGENTS. One cent invested in a postal card will bring you a $35.00 to $60.00 a week proposition. Sterling Aluminum Co., Canal Station, Chicago, Ill.

AGENTS—$50 weekly; we manufacture the best needle case made, a wonderful seller; 200 to 500 per cent profit; talking unnecessary; our copyrighted "Trust Scheme" Envelopes do the work; general agents can make over $100 weekly; send 10c for a 25c sample containing 115 needles; particulars free; buy direct from the factory at wholesale. Paty Needle Co., 102 Union Sq., Somerville, Mass.

BOKARA Diamonds—Agents, everyone, to wear and sell our famous Bokara Diamonds. Write for sample offer and catalogue Free. Northwestern Jewelry Co., 52 Northwestern Bldg., Chicago.

WHERE did your money go? Find out. Begin any time with our Daily Expense Record. It will keep you posted and reduce expenses. A very interesting and complete book—50c. Agents wanted. Auburn Supply Co., Dept HH, 7746 Peoria St., Chicago.

AGENTS: Earn $5 and $10 daily. Sell an entirely new line of Air Brush Design Show Cards, Price Tickets and other novelties. 350 varieties. Every Merchant buys. Catalogue Free. L. D. Thompson Co., 3159 La Salle St., Chicago.

AGENTS—250% profit. Wonderful little article. Sells like wildfire. Can be carried in pocket. Write at once for free sample. H. Mathews, 1962 Third St., Dayton, Ohio.

AGENTS—$5 daily selling our Handy Tool, 12 articles in one. Lightning seller. Sample free. Thomas Mfg. Company, 462 Third St., Dayton, Ohio.

SAMPLE Free—Boyer's Automatic Re-Finisher for Furniture, Store, Bank and office Fixtures—Finest thing in the World. One application lasts a year. Applied with cheese cloth. Boyer Chemical Laboratory Co., State and Michigan Sts., Chicago.

WE manufacture glass paper; plain glass windows made to look like real stained glass; something new; easily applied; big money maker; 2 sample sheets, catalogue in colors, with discount for 10c. Parrish Co., Lakeside Bldg., Chicago.

CHANDELIER Clothes Dryer—Pulls up to ceiling on porch or in house. Clothes out of way. Holds good size washing or ironing; weighs three pounds; sent prepaid, $1.50. Every home will buy one. Agents wanted. Auburn Supply Co., Dept. DD, 7746 Peoria St., Chicago.

SALESPEOPLE everywhere will wish to find out why agents of the "Ever Ready" Specialties are doing better than others. A postal will bring all particulars. A. Lowell Mfg. Co., 108 Fulton St., New York City.

WE furnish you capital to run profitable business of your own. Become our local representative and sell high grade custom made shirts, also guaranteed sweaters, underwear, hosiery and neckties, direct to homes. Write, Steadfast Mills, Dept. 10, Cohoes, N. Y.

AGENTS—Earn $25 to $40 per week selling Nodarn Guaranteed Hosiery. Sales are simply doubled with our New Plan. 2 pr. guaranteed 2 mo., 3 pr. 3 mo., 4 pr. 4 mo., 6 pr. 6 mo. Spring Samples Free. Nodarn Hosiery Mills, Desk I, Dayton, O.

AGENTS Wanted—Mechanics and shopmen make over $100 a month in spare time selling transparent handled novelty knives and razors. Big profits. Sales easily made. Write for terms today. Novelty Cutlery Co., 67 Bar St., Canton, O.

YOU can make $$$$ as our general or local agent. Household necessity; saves 80 per cent; permanent business; exclusive territory; salary or commission; free sample; credit. J. Pitkin, 113 Redd St., Newark, N. Y.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything and guarantee success. Send for proofs. Voorhies, Desk C. R., Omaha, Neb.

AGENTS—Handkerchiefs, dress goods. Carleton made $8 one afternoon; Mrs. Bosworth, $25 in two days. Free samples. Credit. Stamp brings particulars. Freeport Mfg. Company, 59 Main St., Brooklyn, N. Y.

AGENTS—Portraits 35c. Frames 15c. Sheet Pictures 1c. Stereoscopes 25c. Views 1c. 30 days' credit. Samples and catalog free. Consolidated Portrait Co., Dept. 1196, 1027 W. Adams St., Chicago.

AGENTS—Our Columbia Folding Hand Bag is the best proposition on the market. Not sold in stores. Big profit. Write for terms and other big sellers. S. V. Diamond, 35 West 21st St., N. Y. C.

I WILL start you earning $4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operation. G. F. Redmond, Dept. 306, Boston, Mass.

AGENTS—Ask us about our snappy household specialty line which will clear you $50 to $80 weekly. American Aluminum Co., Div. 7, Lemont, Ill.

DON'T fail to read Independence and Fortune under Business Opportunities.

AGENTS—Ladies or gentlemen, to sell the highest grade toilet goods, flavoring, etc., direct to families. High class house; fair dealing; repeat orders sure; large cash commissions. Address Kingham Bros., Indianapolis, Ind.

PERFECTION Pocket Adding Machine. Lightning seller. Agents wanted. Cincinnati Specialty Mfg. Co., Dept. R, Cincinnati, Ohio.

AGENTS wanted for Oriental novelties, never before seen in America. Quick sellers. Repeaters. Immense profits. Shaw Kanematz, Box 529, Portland, Oregon.

1500% PROFIT selling our Gold Sign Letters. We'll show you how. Sample free. Johnston Co., Quincy, Ill.

DUPLICATORS AND DEVICES

THE Modern Duplicator, made without glue or gelatine, is the World's Standard. Fifty to seventy-five exact duplicate copies can be made from each one you write or draw with pen, pencil or typewriter. $2.40 to $6.00 according to size. Booklet Free. Durbeen, Reeves & Co., Mfgrs., 339 Fifth Ave., Pittsburg, Pa.

HOW to get a Hektograph that will make 150 copies in 10 minutes; letter size, $2. Write for circular. Heyer Duplicator Co., 118 No. La Salle St., Chicago.

COLLECTIONS

COLLECTIONS—Bad debts collected everywhere. No collection, no charge. American. Vancouver Mercantile Agency, 336 Hastings St. West, Vancouver, B. C.

ACCOUNTS collected anywhere; strictly commission basis; weekly reports. Benson, Menomonie, Wis.

CLAIMS; all kinds, collected anywhere. Fidelity Credit Co., Richmond, Va.

HELP WANTED

A MONEY Proposition. Do you want to own a mail order business—be independent—your own boss? Would you manage an Agency for me in your vicinity or elsewhere? All printed matter furnished for one-half the profits. Write for particulars. Hazen A. Horton, Desk 617, Tekonsha, Mich.

MEN and Women Wanted for Government Parcel Post and other Government positions. $90 month. Annual vacations. Short hours. Thousands of appointments coming. "Pull" unnecessary. Farmers eligible. Write immediately for free list of positions open. Franklin Institute, Dept. M-21, Rochester, N. Y.

WANTED Salesmen—Earn $250 per month, sell advertised goods. Best contract on earth. Elato Co., Station L, New York, N. Y.

U. S. GOVERNMENT needs Railway Mail Clerks immediately to handle Parcel Post. $90 month. Examinations everywhere May 3rd. Common education sufficient. Write for list of positions open. Franklin Institute, Dept. M-21, Rochester, N. Y.

CASH for information, names, formulas, and ideas. Steady, profitable home business. Instructive booklet for stamp. Information System, 294, Marietta, Ohio.

PARCEL Post means thousands Government Positions open to men and women $75 month. Railway Mail Clerk examinations everywhere May 3rd. Write for list positions open. Franklin Institute, Dept. M-21, Rochester, N. Y.

MAKE money writing short stories. Big pay. Free booklet tells how. United Press Syndicate, San Francisco.

MEN and Women Wanted for Government Parcel Post positions. $90 month. Write for vacancy list. Franklin Institute, Dept. M-21, Rochester, N. Y.

WANTED—People to go on the road as traveling advertisers. P. Breeden, Box 938, Norfolk, Va.

WANTED—Railway Mail Clerks, $90 month. Examinations everywhere May 3rd. Write for vacancy list. Franklin Institute. Dept. M-21, Rochester, N. Y.

BE A detective—Earn $150 to $300 per month; travel over world. Stamp for particulars. National Detective Agency, Dept. S-1, Chicago.

9,500 GOVERNMENT Jobs Open. Write for list. Franklin Institute, Dept. M-21, Rochester, N. Y.

RAILWAY Mail Clerks wanted. Examinations everywhere May 3rd. Sample questions free. Franklin Institute, Dept. M-21, Rochester, N. Y.

BIG money writing songs.—We pay hundreds of dollars a year to successful writers. Experience unnecessary. Song poems wanted with or without music—will pay one-half of profits if successful. Send us your work today. Acceptance guaranteed if available. Largest concern in the country. Free particulars. Dugdale Co., Dept. 265, Washington, D. C.

FREE illustrated book tells of about 300,000 protected positions in U. S. service. Thousands of vacancies every year. There is a big chance here for you, sure and generous pay, lifetime employment. Just ask for booklet S-29. No obligation. Earl Hopkins, Washington, D. C.

WANTED—Hustling man, every town, and country community. Who wants to get ahead, learn, and earn more. Fine chance. Write quick for full particulars. Box A6-293, Covington, Ky.

SALESMEN calling on Railroad and other Machine Shops, Boiler Works, Garages, etc. are invited to communicate with The A. M. Co., 1420, 26 W. Baltimore St., Baltimore, Md.

BIG profits—Open a dyeing and cleaning establishment, little capital needed. We teach by mail. Write for booklet. Ben-Vonde System, Dept. C, Charlotte, N. C.

AGENTS make big money and become sales managers for our goods. Fast office sellers. Fine profits. Particulars and samples free. One Dip Pen Company, Dept. 2, Baltimore, Md.

WRITE Moving Picture Plays; $10 to $100 each; all or spare time; experience or correspondence course unnecessary. Details free. Atlas Publishing Co., 3045, Cincinnati, O.

BE a Detective; Big pay. Easy, pleasant work. Traveling everywhere. Write National Detective Agency, Department 2, Houseman Block, Grand Rapids, Mich.

LOCOMOTIVE Firemen and Brakemen for all Railroads. Wages, $80 to over $100 monthly. Promotion, engineer, conductor. Age 18-35, experience unnecessary. No strike. Rushing business—many hundred men employed monthly. State age; send stamp. Railway Association, Dept. 89, 227 Monroe Street, Brooklyn, N. Y.

INTELLIGENT persons can earn good income at home in spare time copying letters. Fine opportunity, experience unnecessary. Stamp brings particulars. Box 17, Station H. G., New York.

SONG poems wanted—Send us your song poems or melodies. They may become big hits and bring thousands of dollars. Past experience unnecessary. Available work accepted for publication. Instructive booklet and information free. Marks-Goldsmith Co., Dept. 18, Washington, D. C.

REPORT local information, names, etc., to us. Big pay. Enclose stamp. National Information Sales Co., AQH, Cincinnati, O.

DRAW Cartoons. See Hamilton School ad under "Education and Instruction."

ANY intelligent person may earn steady income corresponding for newspapers. Experience unnecessary. Address Press Correspondence Bureau, Washington, D. C.

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Continued from Page 30

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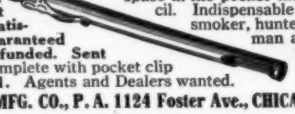

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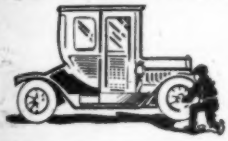

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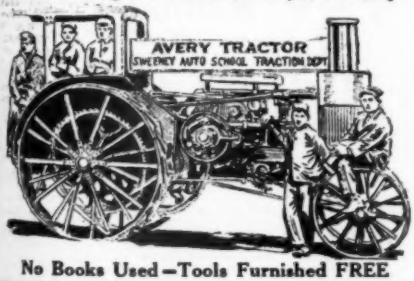

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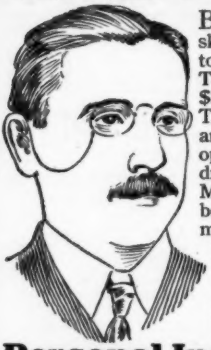

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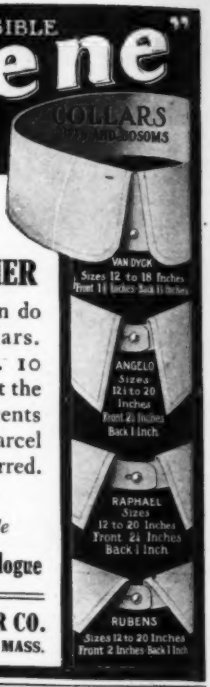

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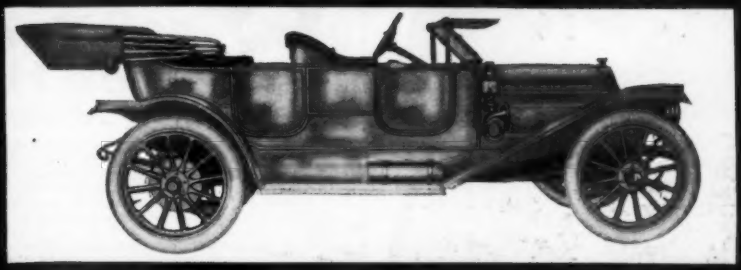

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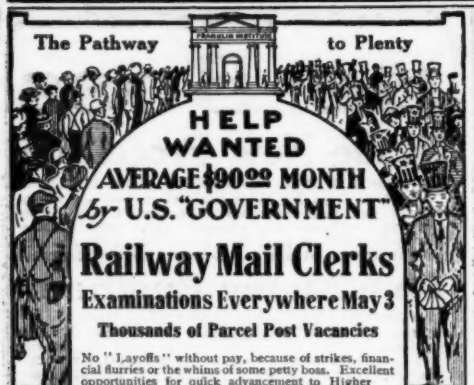

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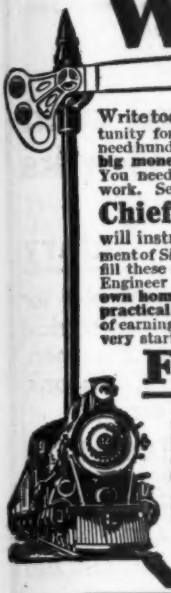

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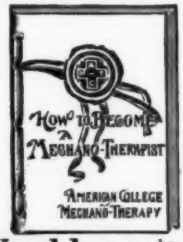

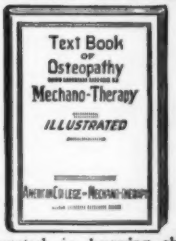

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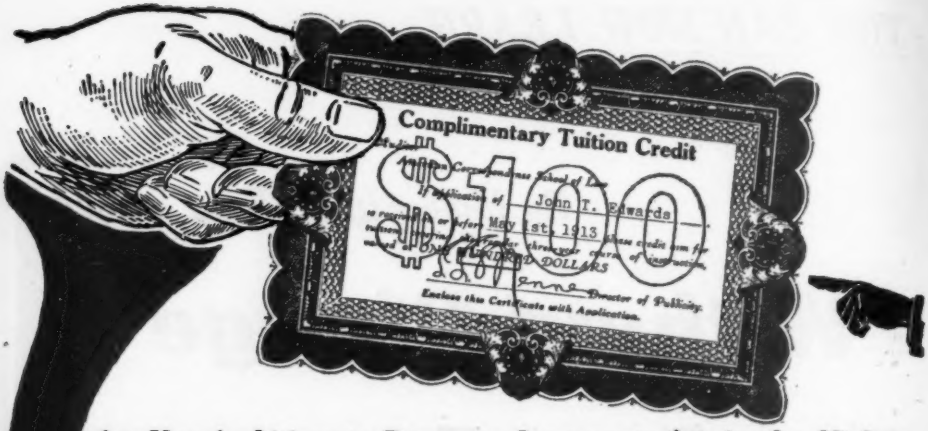

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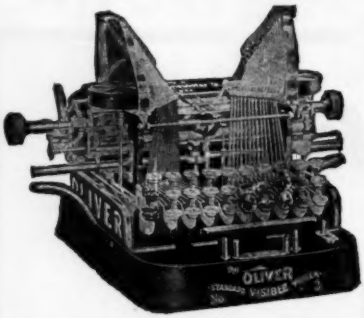

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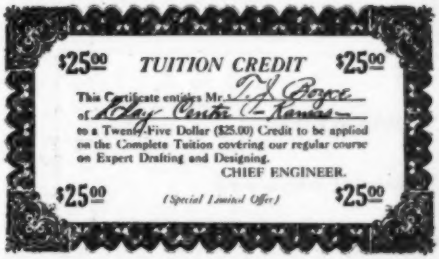

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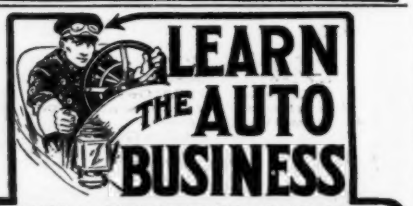

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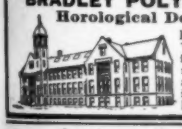

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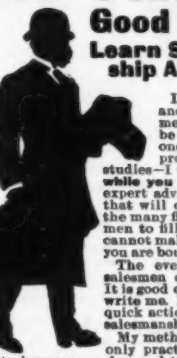

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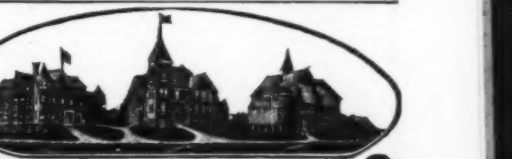

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AMERICAN SCHOOL OF CORRESPONDENCE
CHICAGO, U. S. A.

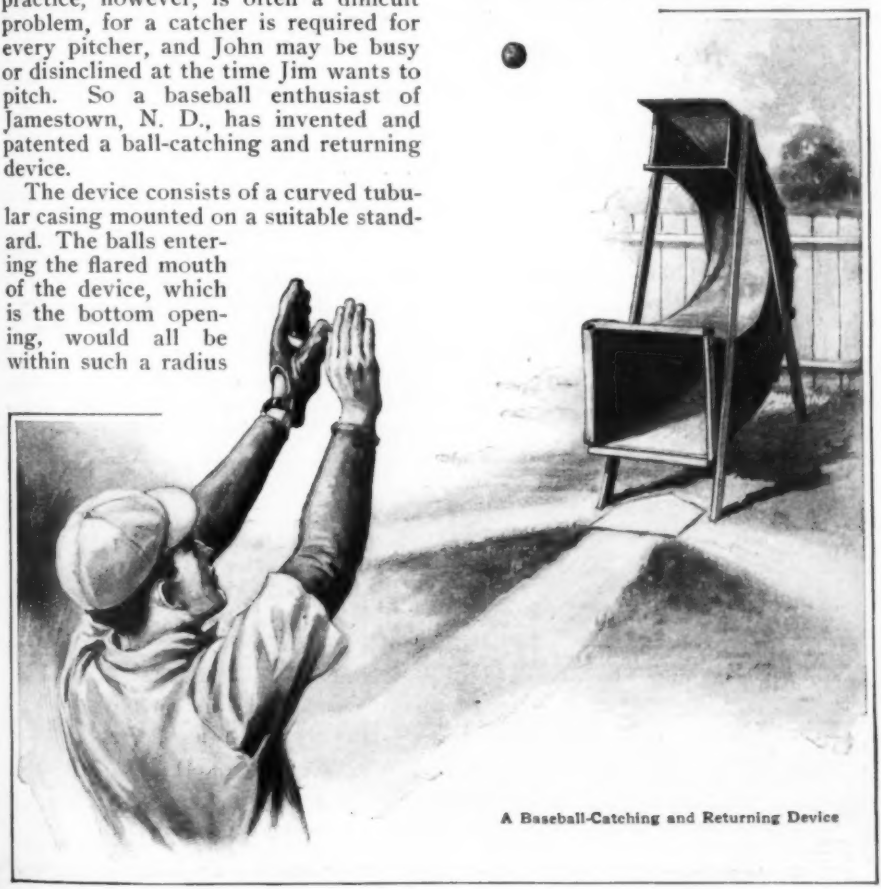
Popular Mechanics Magazine
WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 19 APRIL, 1913 No. 4

Baseball-Catching and Returning Device

BASEBALL pitchers crop up like wild flowers in every part of the country when spring begins to make itself felt, and there is hardly a village, even a four corners, that does not hold an aspirant for big-league honors who believes that all he requires is systematic practice. Just how to get the practice, however, is often a difficult problem, for a catcher is required for every pitcher, and John may be busy or disinclined at the time Jim wants to pitch. So a baseball enthusiast of Jamestown, N. D., has invented and patented a ball-catching and returning device.

The device consists of a curved tubular casing mounted on a suitable standard. The balls entering the flared mouth of the device, which is the bottom opening, would all be within such a radius as to be termed a strike. Entering this opening, they strike against the curved back of the casing, run up the curved neck and are discharged from the upper opening with sufficient force, so the inventor claims, to return to the pitcher, or at least to enable him to catch them with a very short run.



A Baseball-Catching and Returning Device

A hinged flap, or wing, designed to form a continuation of the side of the casing, projects over the top of the discharge mouth. This wing may be moved downward for swift balls, and upward for slow balls, thus regulating the velocity of the return of the ball. Modifications of this device may be used for indoor games, in which a ball as large as a basketball can be used.

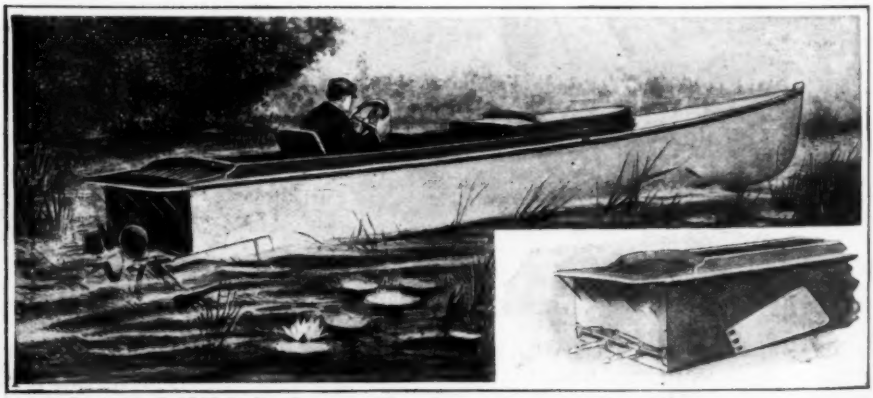
PORTABLE SEARCHLIGHT FOR LINEMEN

The difficulty of detecting a crossed or broken overhead wire at night with an ordinary hand lantern has resulted in the invention of an acetylene searchlight connected by a strong flexible rubber tube to a tank carried in a leather case on the back of the lineman using it. The lamp has a powerful reflector that throws a concentrated beam of light which will make objects distinguishable at a distance of 75 to 100 ft.

SURFACE-PROPELLERED MOTORBOAT

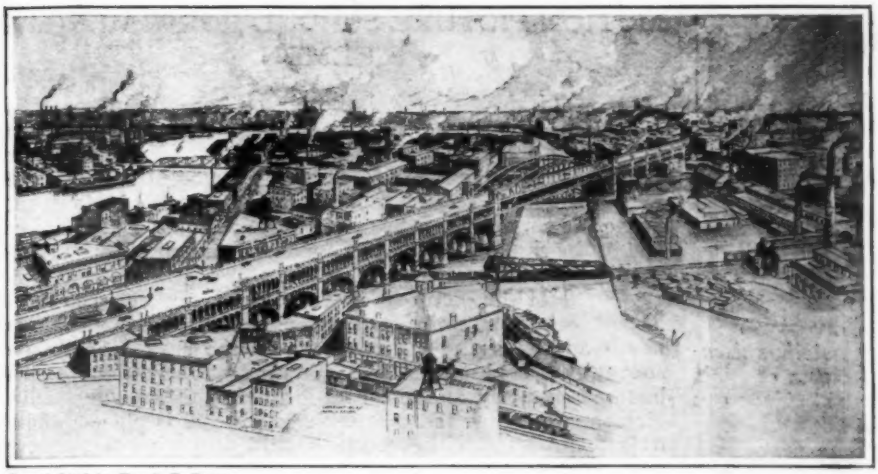
The twin "surface" or semisubmerged propellers and the folding side rudders are the features of this high-speed motorboat, which, although designed particularly for use on weed-filled waterways, is also being developed as a type of craft particularly adapted for use in waters where sudden storms make the possibility of "beaching" an important factor.

It is the weedless feature, however, combined with the high speed, that is the most interesting. Weighing considerably over a ton, the little 22½-ft. hull, driven by a 25-hp. engine, makes a speed of as high as 20 miles an hour in water having a depth of but from 1 to 2 ft., heavily grown with eel grass. In several tests at low tide, over river flats, where the grass lay on the top of the water and the tips of the propeller blades actually dug into the mud at times, the boat maintained its high speed, although chopped eel grass was actually driven in under the brass fittings on the transom and into every



The Arrangement of "Surface" Propellers and Side Rudders

The Rudders Folded Forward Out of the Way for Beaching



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Cleveland's 2,880-Ft. Double-Decked Viaduct, Construction of Which has Commenced

corner above water where it could hang.

The side rudders, which may be detached from the operating mechanism and folded out of the way, should it be desirable to run the boat upon a beach, are also weed-proof.

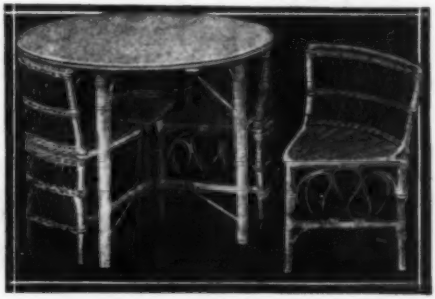
A novel feature of the power plant is the arrangement by means of which the two propellers are driven by the one engine. One propeller and shaft is coupled direct to the engine shaft, and upon the first mentioned shaft is mounted a gear wheel engaging with a similar wheel on the shaft of the second propeller, which it thus drives. Of course, with this arrangement, one propeller revolves to the right and the other to the left.

CLEVELAND'S GREAT CONCRETE BRIDGE

One of the largest and most artistic concrete viaducts in the country is being erected over the Cuyahoga River in Cleveland. It has a length of 2,880 ft., and is a double-decker, the upper deck carrying a driveway 42 ft. wide, for automobiles and other vehicles, with 12 ft. of sidewalk on each side. The lower deck will carry four street-railway tracks. The clearance over the channel will be 93 ft. About 1,500 premolded concrete piles are being driven to carry the nine piers nearest the water.

COMPACT WILLOW TABLE AND CHAIRS

A willow table with four specially constructed chairs, which are so designed that they may be slipped under the table in an upright position, thus enlarging the floor space and improving the general appearance of the room, is being manufactured for use in restaurants, summer gardens, lawns or porches. The seats of the chairs are brought to a point in front instead of being square-bottomed, and the backs are made low enough to be pushed beneath the top of the table.



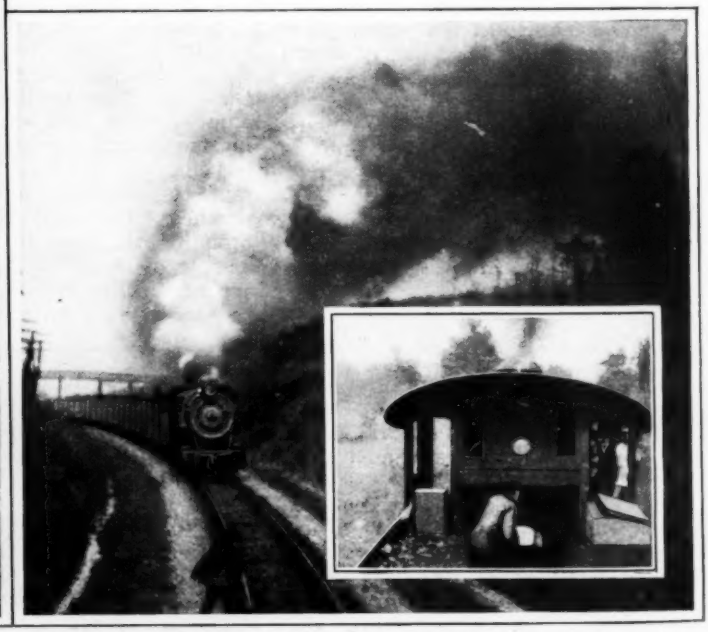
Willow Table with Disappearing Chairs

MOTION-PICTURE SCHOOL FOR RAILROAD FIREMEN

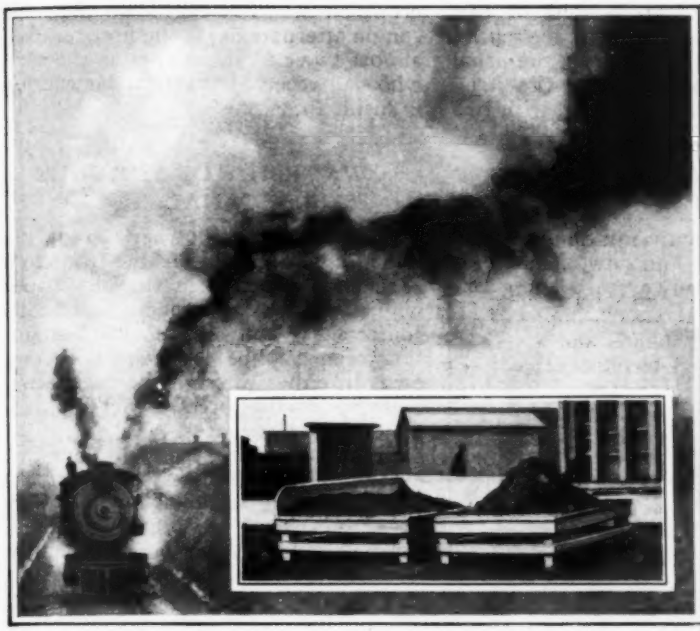
A MOTION-PICTURE theater on wheels has recently been inaugurated by the educational bureaus of several railroads for the purpose of demonstrating fuel economy to firemen and engineers. The demonstration coach is equipped with a moving-picture machine which throws pictures of the proper and improper firing of locomotives on a screen at one end of the car, and the classes for instruction occupy the regular car seats facing the screen.

Some of the pictures show the difference between stiff-back firing, where the coal scoop is held tight with both hands and a jerking strain comes on the back each time a shovelful of coal is fired, and easy firing, where the scoop is handled properly and the coal is fired with a swing. The pictures also show the ease with which coal is placed where it is wanted when the scoop is held properly; the proper method of lining up the sides and corners of the fire box; the way in which to turn the scoop to put a fire directly under the door; the proper amount of coal to pick up in the scoop, and the bad results of picking up too much.

In addition to the proper handling of the scoop shovel, the right method of preparing the fire before starting upon the trip is also shown by pictures indicating how the fire should be built up gradually, starting long enough before leaving



Dummy Firebox, Showing Wrong Firing. Double-Header, Flagged: First Engine, Properly Fired; Second Engine, Improperly. Small View: Improper Firing



Double-Header on Hill: First Engine Fired Correctly, But Second Engine is Not. Insert Shows Amount of Coal Wasted by Allowing Engine to "Pop Off" for 3½ Minutes. Views on Right: Double-Header Leaving Yard, Front Engine Stack Clear; Rear Engine Producing Pillar of Smoke

Teaching with "Movies" — A Strip of Film

time to get a good, bright bed of fire on the grates. One of the accompanying illustrations of a double-header going up a hill amply demonstrates this fact, as the fireman on the first engine fired his engine properly, thus making practically no smoke and plenty of steam, while the fireman on the second engine made volumes of smoke, but failed to keep his fire in a proper condition for raising the maximum amount of steam.

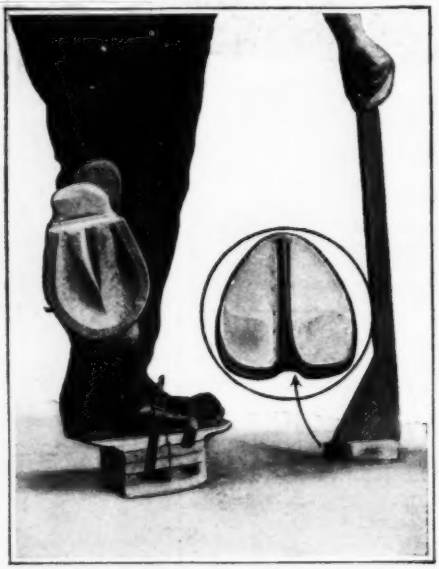
As the average fireman has no realization of the discomfort caused passengers by smoke traveling back over the train, a moving picture, taken from the observation platform of a passenger train, is also thrown on the screen to vividly impress this objectionable feature upon the minds of the observers. Another film, portraying the useless waste of fuel due to the improper coaling of engines, illustrates the engine moving up to the coal chute; the tank properly filled, but not overflowing; and then additional coal being put on the tank until it overflows and the excess falls upon the ground to become a total loss.

That the teaching of fuel economy to firemen and engineers with the aid of moving pictures is a valuable method of instruction is evidenced from a test run made by the engine and crew of a Lehigh Valley passenger train from Buffalo to Jersey City. This trip was made with an average of about 7 lb. of coal to the car mile instead of about 24 lb., the average

for the year. Only 15 tons of fuel were actually used during the entire run, as against 25 or 30 tons, the usual amount consumed during the trip. Additional tests showed that, with two crews on the same engine on the same run on alternate days, one fireman used almost twice as much coal as the man who had received practical instruction in firing an engine.

THE BURGLAR WITH A "CLOVEN HOOF"

Curious wooden imitations of the hoofs of a horse and cow, found hidden beside a roadway, are being exhibited by the chief of police of Long Beach, Cal., as the ingenious means used by a burglar to throw pursuers off his trail. Other articles found along with the hoofs were a bottle of nitroglycerin, and other tools of the yeggman's trade. The "hoof" idea is believed to be something entirely new in police history.



The Burglar's Wooden Hoofs, Designed to Throw Pursuers Off the Trail

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¶It is estimated that the total mileage made by automobiles registered in Massachusetts during one year is about 185,806,000, while the mileage on the New York state roads approximates 400,000,000 per year.

OWNERSHIP OF THE SUEZ CANAL

The question of ownership of the Suez Canal has come to the front to a considerable extent in the newspaper publicity given the Panama Canal tolls controversy, and the general assumption seems to be that Great Britain owns it, either through the occupation of Egypt, or by direct ownership of a majority of the shares.

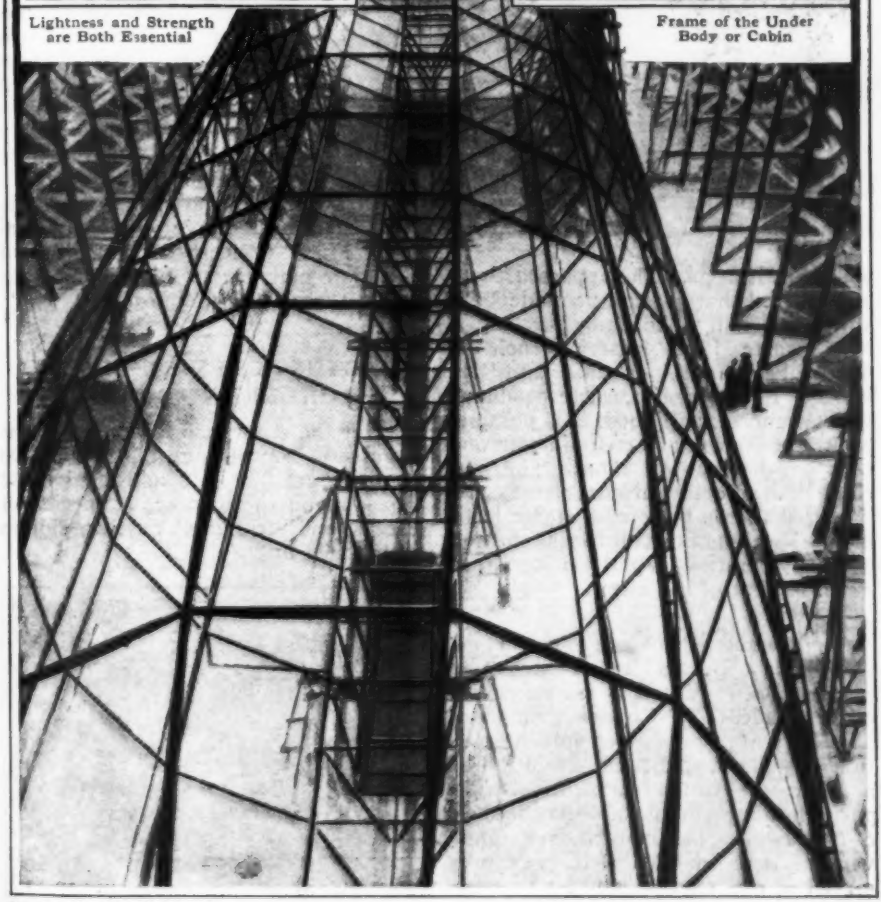
"The British government does not own it, but is merely a private stockholder, and does not own even a majority of the shares," says the Wall Street Journal. "It has, in fact, an equity which might, in conceivable circumstances, be extinguished altogether. The affairs of the canal are governed from Paris. On the board of directors are 21 French members, 10 English and one Egyptian. The manager and secretary, together with the president, and even the manager of the London office, are French. The majority of the stock is owned by private interests in France."

A DIRIGIBLE BALLOON IN THE MAKING

The accompanying illustrations show a new dirigible in course of construction in France. This battleship of the air is of the Spiess rigid type and has a length of 288 ft., a maximum diameter of 39 ft., and a volume of approximately 293,000 cu. ft. The balloon is designed to have a total lifting capacity of nearly nine tons and will contain 11 separate gas bags. The motive power will be furnished by two 120-hp. motors coupled to four propellers which are to be arranged and driven as in the Zeppelin airships of Germany. It is estimated that the new dirigible will have a speed of about 35 miles per hour.

Lightness and Strength are Both Essential

Frame of the Under Body or Cabin

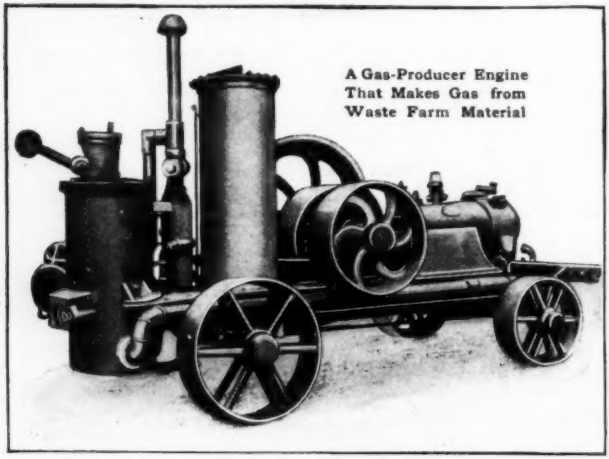


Courtesy Illus. London News

A Battleship of the Air in Course of Construction in France

GAS PRODUCER AND ENGINE FOR FARMERS

A farm engine driven by a gas motor and equipped with a producing plant for making its own gas has been invented in Europe. The apparatus is so constructed that gas can be made from anthracite coal, coke and charcoal, or even waste farm material such as moldy hay, bark, sawdust and dry leaves. By the use of waste products, such as those mentioned, it is possible to produce power at a cost of about one cent per horsepower hour. The machine is made in various sizes; sells for one-half the price of a steam locomobile; weighs one-third less, and the cost of operation is but one-tenth as much as that of the latter.



A Gas-Producer Engine That Makes Gas from Waste Farm Material

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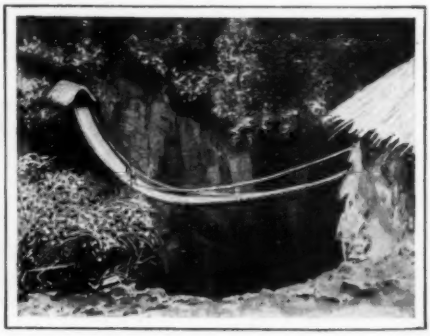
¶A novel method of preserving eggs, for which a United States patent has recently been granted, is the invention of a resident of London, England. The eggs are first dipped into a solution of gelatin, then into a solution of amyl acetate, which is a celluloid composition that maintains around the shell of each egg the atmosphere of camphor vapor. It is claimed that eggs preserved in this manner may be kept for a year at any ordinary temperature and will then taste like fresh-laid eggs.

ELECTRICAL CLUB HOUSE FOR EMPLOYES

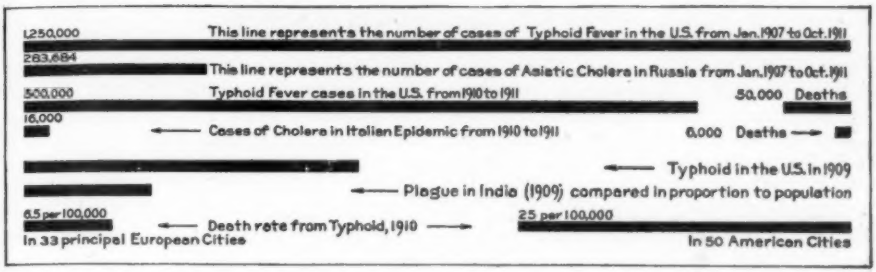
Electrical baths is one of the new features of the new club house recently opened in New York City for the employes of a large corporation. All of the members may now avail themselves of the benefits of electric bathing, along with the other privileges which the new club house offers. The members may also take a four-year course of instruction in electrical engineering under competent teachers without any cost to themselves, as a thoroughly equipped laboratory is maintained for this purpose. Owing to its complete and unusual electrical equipment this new club house might almost be called the electrical club house.

CACTUS-ROPE BRIDGE TWO HUNDRED FEET LONG

Over the Apurimac River in Peru is a graceful rope bridge more than 200 ft. in length. It is constructed of 32 ropes made of maguey, a species of cactus, and terminates on each side in a thatched hut.



Rope Bridge Made by the Natives of Peru



THE BATTLE FOR SAFE WATER SUPPLIES—I

By Dr. ALLAN McLAUGHLIN

United States Public Health Service

[Two and one-half times as much typhoid fever in the United States in proportion to population as there is plague in India! More deaths by eight times from typhoid in the United States in two years than there were from cholera in Italy in the same years of the great cholera epidemic! Nearly four times as many deaths from typhoid among a given number of American citizens as among the peoples of overcrowded Europe! These startling facts ought to convince America that the prevalence of typhoid is our greatest national disgrace—for the stamping out of typhoid is easy. A pure water supply will cut its ravages down instantly.

New York is spending $125,000,000 on a reservoir that will impound the streams of half the Catskills and a tunnel one hundred miles through solid rock to bring the pure mountain water to its people. Los Angeles has gone 250 miles up into the snow-capped Sierras and tapped the Owen River for water for a hundred years to come. San Francisco wants to dam the Hetch-Hetchy valley in the Yosemite National Park as a reservoir from which to obtain an unfailing supply of pure water. Even little villages are putting in water works and purification plants to get water free from typhoid germs.

Just what dangers lie in impure water is told in this first article of a series written especially for Popular Mechanics Magazine by Dr. Allan McLaughlin of the United States Public Health Service. Doctor McLaughlin is recognized as perhaps the foremost American authority on this subject. His work in the Public Health Service has been notable and resulted in his recent appointment as sanitary adviser to the International Joint Commission which is investigating the pollution of the boundary waters between the United States and Canada. Later articles will discuss the best methods of water purification and their cost.—Editor.]

THE question of sewage-polluted water supplies is indissolubly connected with the excessive prevalence of typhoid fever in the United States. Polluted water supplies are responsible for excessive rates of dysentery, for an increased general death rate, and are also a significant factor in our infant mortality; but typhoid fever is the greatest single item of loss to be charged to contaminated water.

This excessive prevalence of typhoid fever in the United States has been characterized, and not without reason, as a national disgrace. Certainly that portion of our typhoid prevalence which is due to polluted water supplies is preventable, and our failure to prevent does not redound to our credit. The rather common use of sewage-polluted water supplies without purification has been responsible for disaster in the shape of typhoid-fever epidemics in our cities, with a frequency not pleasant to contemplate.

The average American citizen displays toward sanitary problems a very dangerous apathy. It is difficult to arouse his interest in anything so well-known as typhoid fever. Cholera or plague, or any scourge which to him suggests a quick and mysterious death, will awaken his instinct of self-preservation and arouse him to activity; not so typhoid fever. It has been all about him always, excites no terror, and is viewed indifferently as an inevitable visitation which comes every year and takes its toll from the community. He never asks himself, "Is this visitation inevitable?" or, "May not typhoid fever be prevented or reduced?" Twenty deaths per 100,000 probably represent 200 cases of typhoid fever. Suppose 200 cases of Asiatic cholera or of bubonic plague occurred in any American city of 100,000 population. Would not strenuous activity be displayed, and very properly so, for the eradication of the scourge? The complacency of officials in the face of typhoid-fever rates above 20 deaths

annually per 100,000 population is difficult to explain. If the rate is below 20, many municipal officials are inclined to be satisfied with this rate, because it is lower than that of less fortunate cities.

What may be considered a low rate for typhoid fever? Let us compare typhoid-fever rates in American cities with those of the northern European cities.

In Chicago, in 1906, 18 persons out of every 100,000 died of typhoid fever. In Stockholm, Sweden, in the same year, only two persons died of typhoid out of every 100,000 population. The typhoid death rate of Louisville, Kentucky, in 1910, was 31 per 100,000 population; and in 1907 almost reached the appalling figure of 70 deaths from this one disease for each 100,000 citizens. But in Hamburg, Germany, in 1910, the rate was only a trifle over four per 100,000, and, in 1907, was only three. Indianapolis, New Orleans, Detroit, Saint Paul, Minneapolis, Kansas City, Omaha, Buffalo, Columbus, Toledo, Pittsburgh, Memphis, Nashville and Milwaukee, in 1909, lost 18 or more out of every 100,000 of their inhabitants from typhoid, while neither Christiana, Norway; Munich, Berlin and Dresden, Germany; Edinburgh and Glasgow, Scotland; Vienna, Austria; Copenhagen, Denmark, nor London, England, in the same year lost as many as five citizens out of each 100,000 from this disease. The 33 principal European cities, with a total population of 31,500,000, show a death rate from typhoid, in 1910, of 6.5 per 100,000 population, or a total of less than 2,050 deaths from this disease in all the cities in that year. In the same year 50 American cities having a total population of 20,250,000 lost 5,062 of their inhabitants from the same cause. The excess of 18 deaths per 100,000 in America over Europe shows that the cases of typhoid fever which were preventable by methods within our grasp would probably reach 175,000, and the deaths so avoided would reach a total of 16,200. In 1909, there were more cases of typhoid fever in the United States than there were cases of plague in India, in spite of the fact that India's population is two and one-half times that of the United States.

Section of the Ten-Foot Pipe of the Los Angeles Aqueduct

From January, 1907, to October, 1911, there occurred in Russia 283,684 cases of Asiatic cholera. This included the appalling epidemic of 1910. According to a conservative estimate there occurred in the United States during the same period 1,250,000 cases of typhoid fever, or more than four cases of typhoid fever in the United States for every case of cholera in Russia. We heard a great deal of the terrible ravages of cholera in Italy in 1910-11; yet in these two years there occurred in Italy about 16,000 cases of cholera, with about 6,000 deaths, and in the United States in the same period we had more than a half million cases of typhoid fever and 50,000 deaths.

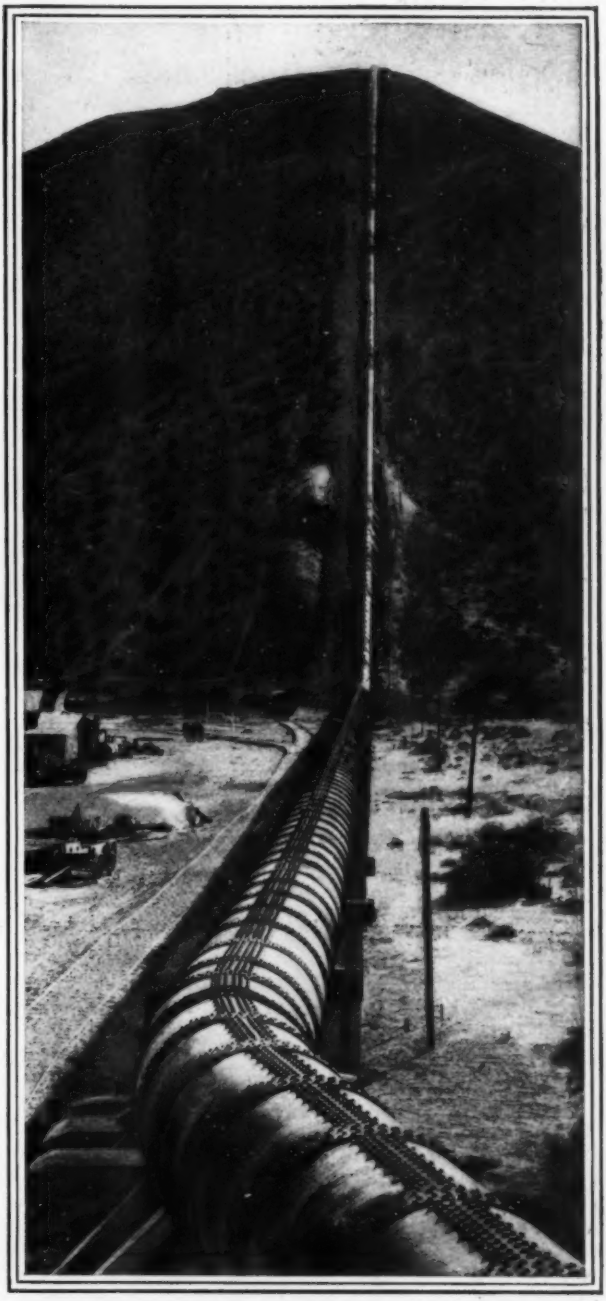
We are accustomed to speak of certain countries as pest-ridden, and a residence in them or even a brief visit is considered with apprehension. But do we consider the prevalence of typhoid fever in our country with sufficient seriousness?

No single measure in reducing typhoid fever on a large scale approaches the effect of substituting a safe for a polluted water supply. As an instance of this wholesale saving of human life the reduction of typhoid fever in Pittsburgh may be cited. Since the instal-

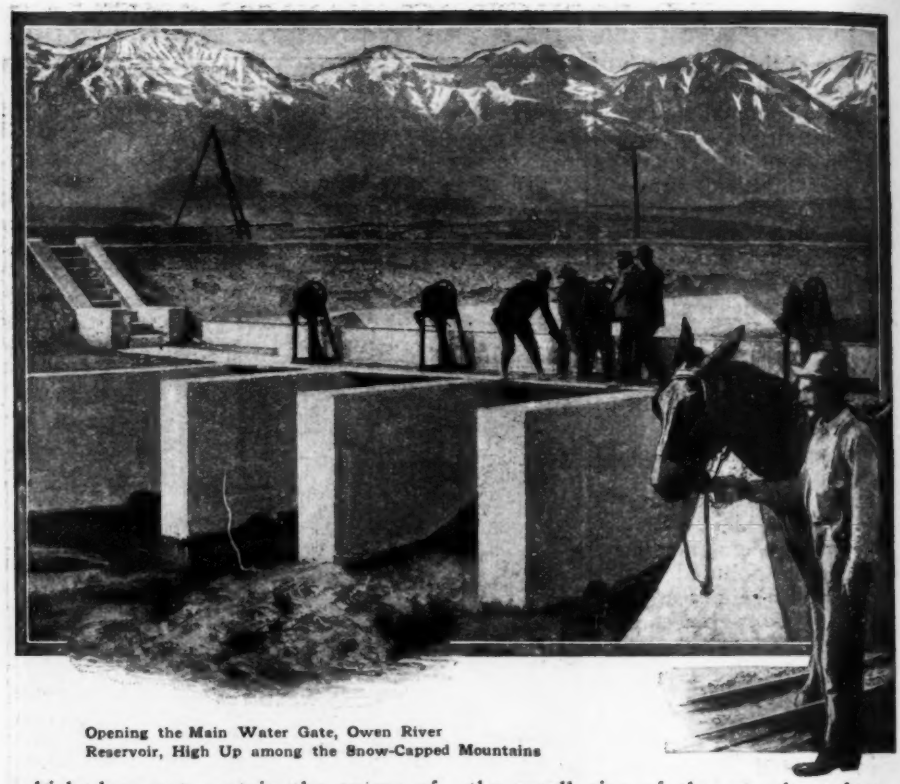
lation of the Pittsburgh filter plants there has been an annual saving in that city of 400 lives from typhoid fever alone. Statistics prove the effect of the various methods of water purification in reducing the typhoid-fever rate.

The battle for safe water supplies has been beset with many difficulties. It is extremely difficult to shake the average citizen out of his apathetic attitude toward preventable disease. It is necessary to educate him so that he will understand the danger in polluted water, and the necessity for a safe water supply. He must be shown what constitutes safe water. He must be taught that safe water is essential for his health and happiness and that it is his inalienable right to demand and receive safe water from the municipality. There is also the difficulty of arousing municipal officials to a sense of their responsibility in the matter of water supply. They must be convinced that it is their plain duty to furnish safe water to the citizens 365 days in the year. Failure to do this results in wholesale homicide, and where the facts of pollution are known it amounts to passive murder.

What is a safe water supply? From a sanitary standpoint, a safe water supply is one



Through This Ten-Foot Siphon the Water Lifts Itself over a Hill 850 Feet High

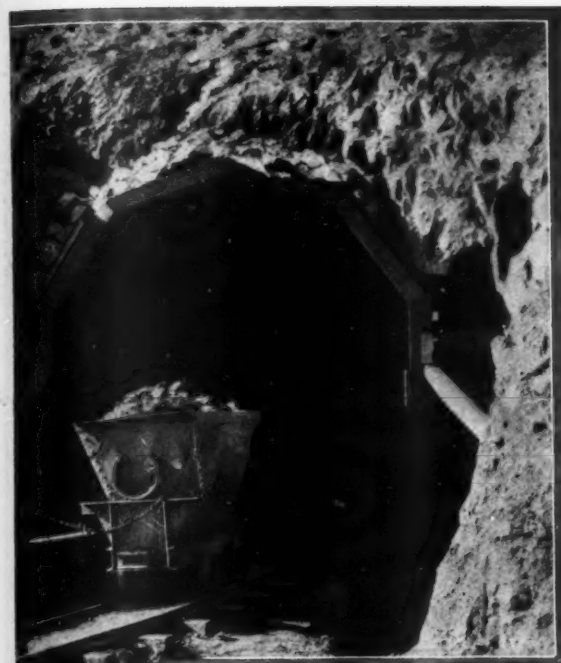


Opening the Main Water Gate, Owen River Reservoir, High Up among the Snow-Capped Mountains

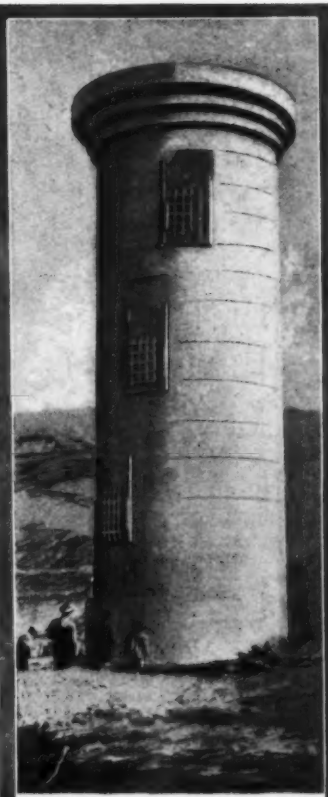
which does not contain the germs of typhoid fever, cholera, dysentery, or other diseases. How do we know when the supply is safe? There is only one way in which we can assure ourselves that the water supply is safe, and that is by daily bacteriological examination. In plain words, samples must be taken to determine the number of germs in each cubic centimeter (1 c.c. = about 15 drops) and the presence or absence of germs which are of fæcal or intestinal origin.

A good, safe water supply should contain not more than 100 germs to the cubic centimeter, and should show absence of the colon bacillus or other organisms of sewage origin. The predominant germs in intestinal discharges are the colon bacillus and its relatives. These germs greatly outnumber the typhoid or other disease-producing germs to be found in sewage. It is a "needle in the haystack" proposition to find the typhoid bacillus in water because of the small size of the samples taken. It is the custom, therefore, to test for the colon bacillus, because the probability of finding it is very much greater in samples of 10 cubic centimeters (about one dessert-spoonful). The presence of the colon bacillus indicates fæcal contamination, and fæcal contamination means the possibility of typhoid or other intestinal germs being in the water.

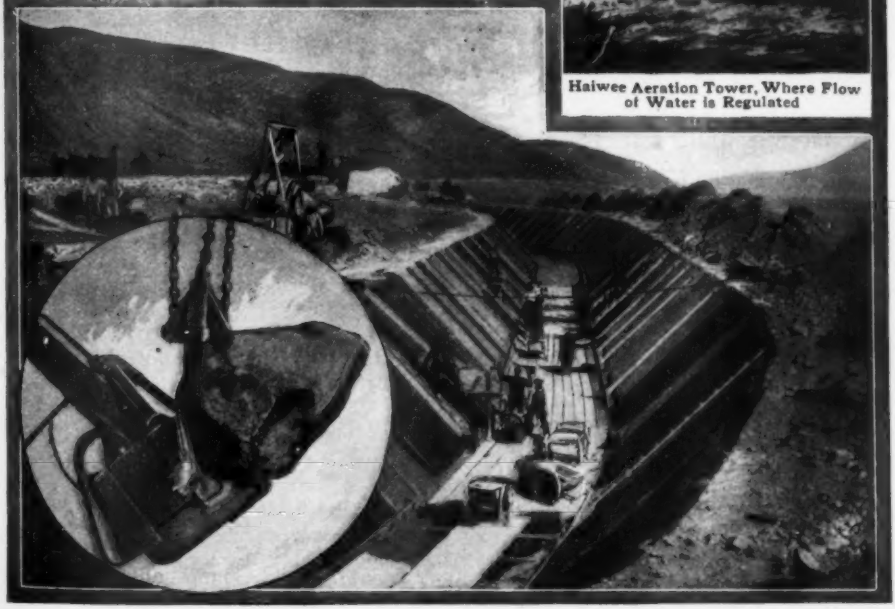
The knowledge and acceptance of these simple facts as to what constitutes safe water would solve the problem. Although these standards for safe water are accepted by the leading sanitarians all over the world, we find American municipal authorities satisfied with water which is known to be polluted, and in many instances assuming their supplies to be safe without proper daily bacteriological examination. We find further that the average American citizen does not know what constitutes safe water and patiently and



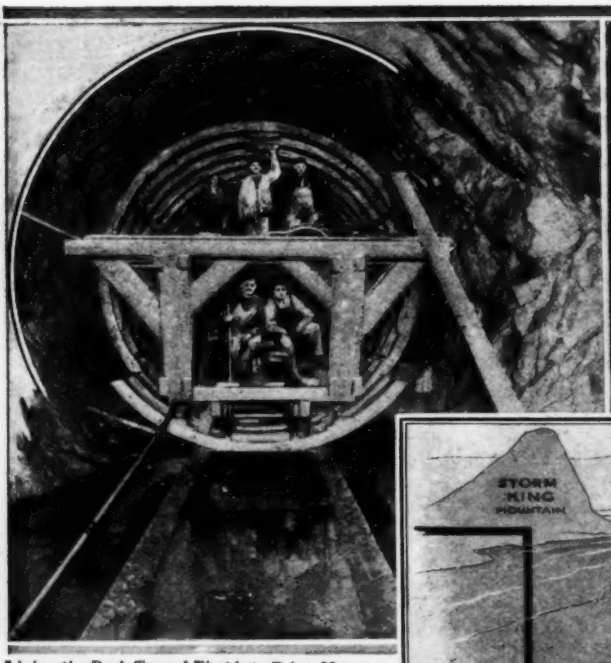
South Portal of the Tunnel on the "Seven Power" Division



Haiwee Aeration Tower, Where Flow of Water is Regulated



Open-Ditch Construction of the Los Angeles Aqueduct, 250 Miles Long, with a Total Fall of Three-Quarters of a Mile; Cost $24,500,000. There are 22 Miles of Unlined Ditch and 38 Miles of Open Concrete Conduit



Lining the Rock Tunnel That is to Bring Mountain Water 100 Miles to New York

Photo by Paul Thompson

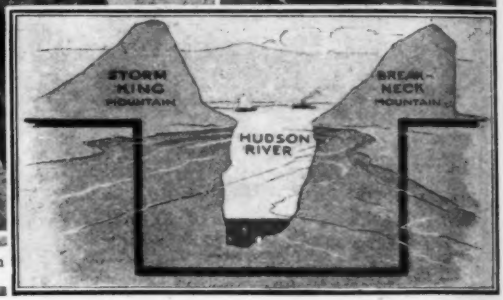


Diagram Showing How Tunnel is Carried under Hudson River

trustfully accepts the polluted water furnished him by the municipality.

American water rates are usually about $2.50 per capita. Safe water supplies are within the reach of every one; the additional cost of purification when necessary would be small. In fact, in Toledo, Ohio, the installation of an efficient mechanical filter plant resulted in lower rates because of more general use and increased consumption of the new supply. The most expensive methods of purification cost less per capita than what the average citizen pays for ice or telephone.

Purified water supplies, safe at all times, would result in a typhoid fever reduction to less than 10 deaths per 100,000. This would mean an annual saving of at least 15,000 lives from typhoid fever alone, and the prevention of at least 150,000 cases of typhoid fever. Is this saving of life worth the cost? It is the writer's opinion that safe water is worth all we ever pay for it, and that this cost is so reasonable that there is no excuse for any city's failure to supply safe water 365 days in the year.

WIRELESS STATIONS OF THE WORLD

There are 375 public wireless coast stations in the world at the present time, according to a report from the International Bureau of Wireless Telegraphy. Of this number the United States has 142; Canada, 33; Great Britain, 43; Germany and its colonies, 22; Italy, 19; Russia, 19; France, 17; Spain, 10, and Denmark, 9. The British and French colonies also have a number of stations.

Of the wireless stations on board war vessels the United States has 247; Great Britain, 213; France, 141; Germany, 112; Italy, 77; Japan, 70, and Russia, 70. The merchant marine of Great Britain has 455 stations; the United States, 253; Germany, 206; France, 68, and Italy, 47.

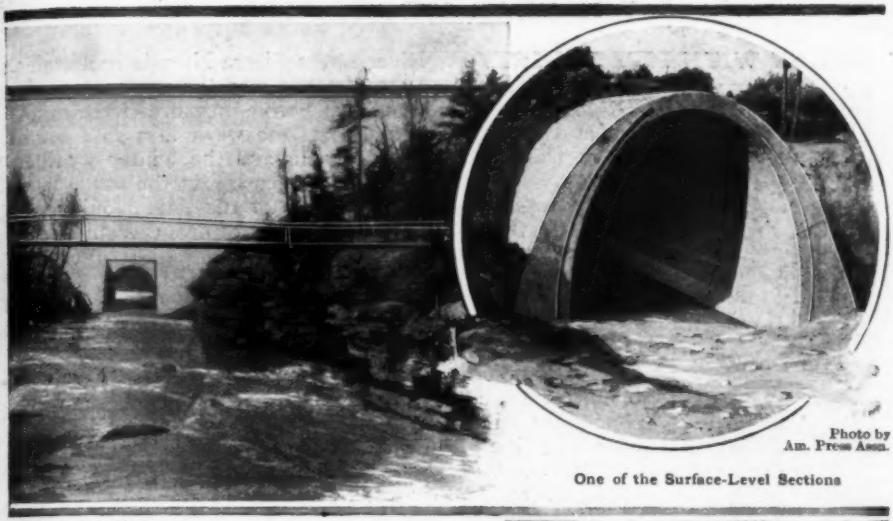


Photo by Am. Press Assn.

One of the Surface-Level Sections

Photo by Paul Thompson

Olive Creek Dam That Impounds Water for Ashokan Reservoir

Photo by Am. Press Assn.

A Completed Section of the Tunnel, Which is Lined with Concrete Throughout Its Length

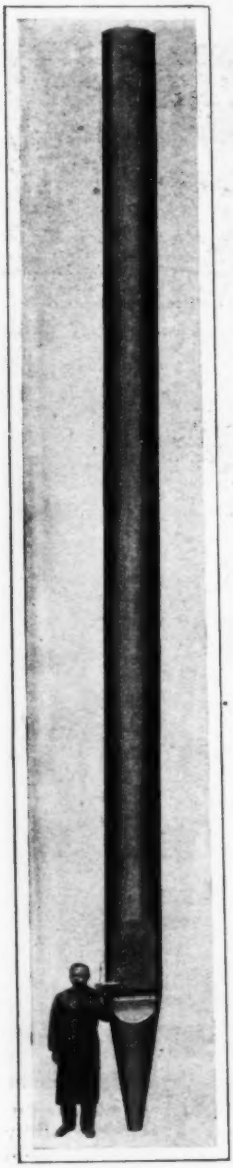
A Deep Cut through Solid Rock

Photo by Paul Thompson

New York's Aqueduct That Cost $125,000,000 and is Hewn through Solid Rock under Mountains and City Streets

ORGAN WITH PIPES THIRTY-SEVEN FEET LONG

The new electrically operated organ of St. Michael's Church, in Hamburg, Germany, is one of the largest in the world. It has 12,173 pipes, a total of 163 voices or main registers, 125 auxiliary registers for combining further shades of timbre; five keyboards, each of 61 keys, and a pedal keyboard of 32 keys. The height of the organ is 57 ft., the longest pipes, one of which is shown in the accompanying illustration, are 37 ft. long, and the shortest are about 1 in. in length. The organ took nearly three years to construct.



MOTOR TRUCKS UNDERGO SEVERE TESTS

Two big tasks of an unusually severe nature were successfully accomplished recently in California by motor trucks. One of these was in connection with the construction of the Big Meadows dam, on the Feather River in the Sierra Nevada mountains. Late last summer the contractors decided that heroic measures were necessary to put the work in a safe condition to withstand the winter weather. Several villages lay in the valley, and the breakage of the dam would have meant great loss of property and probably of life. Cement and other material had to be hauled from Keddy, 25 miles distant, and, as the materials had to be rushed, the only apparent way to accomplish the task successfully was by motor trucks. Five cars were used, and these, carrying 5-ton loads, were run 24 hours a day for 40 days. The roads were so bad that new tires had to be put on every 1,000 miles, but the cars themselves stood the strain successfully.

The other test was in the transportation of all the material for an 8-in. oil-pipe line which passes over a long stretch of the Mohave Desert, and crosses the coast range at an elevation of 3,900 ft. The length of this line is 158 miles, yet all the work of hauling the steel pipe, having lengths of 15 and 22 ft., was done by a fleet of 15 motor trucks.

SHIP DESTROYED BY ITS CARGO OF SODIUM

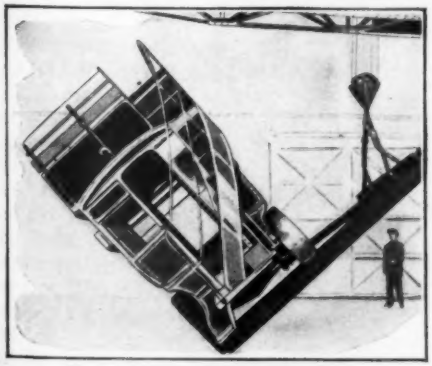
The disaster which befell the steamship "Hardy" through the "vindictive" behavior of its "demon cargo" is one that will go down in ship annals as remarkable. The cargo consisted of metallic sodium in cases and mineral waters. Some of this water reached the sodium and set a quantity of it on fire, and the captain, not understanding the nature of sodium, ordered the hose played upon it. As a result, two tons of it was set on fire and several explosions followed. Nonplussed, the captain then ordered all of the cases thrown into the sea. Some of the first of these cases exploded, others were thrown back onto the deck in a fiery condition by the explosion, the vessel caught fire, and a terrific explosion of the cases still in the hold caused the vessel to break amidships and sink.

DEVELOPING NEW COAL FIELD BY ELECTRIC POWER

A new soft-coal field, which is said to be even larger than the great bituminous fields of Western Pennsylvania, has been recently opened to development by the construction of a railroad from West Virginia through the Carolinas to the Atlantic seaboard. This new coal field underlies parts of Tennessee, Virginia, West Virginia and Kentucky, south and west of the West Virginia fields which are already under development. A $500,000 electric plant, operated by coal produced from a mine at its door, is being constructed to furnish power for the operation of the first mines in this territory.

LONDON OMNIBUSES TESTED BY TILTING THEM

The stability of the motor omnibuses of London is ascertained before the vehicles are put into commission by subjecting them to a series of tilting tests, one of which is here shown. These tests indicate that the busses, when empty, will capsize when the rear axle is at an angle of 41 deg. When the top only of the vehicle is loaded an angle of but 28 deg. is required, and if loaded inside and outside, the carriage will fall over when the axle is raised to an angle of 35 deg.



London Omnibus Undergoing a Tilting Test

BEARD FORMED OF LIVE HONEYBEES

This man is wearing a temporary beard formed of live bees that were caught in the act of swarming and in-

Copyrighted by Underwood & Underwood, N. Y.
This Beard is Formed of Live Honeybees

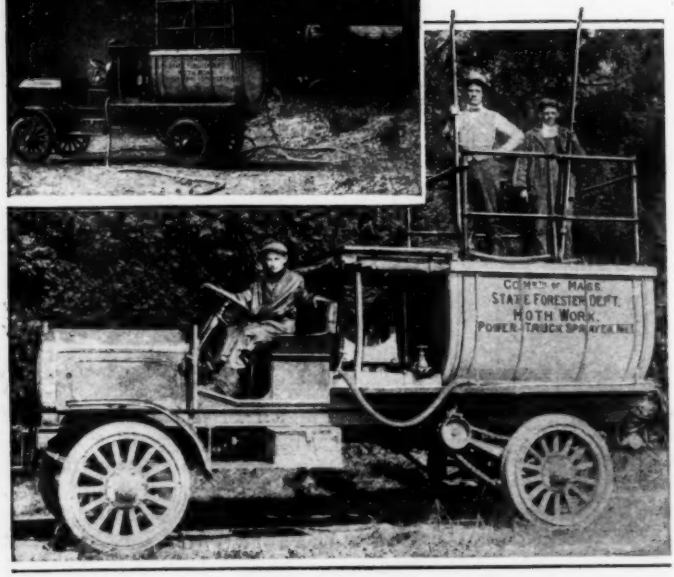
duced to form the beard by putting the queen bee into a small cage and suspending it from the man's chin. The cluster of honey gatherers was then dropped in front of a hive by a shake of the head and the swarm went into their new quarters accompanied by their queen, thus forming a new colony.

¶A prize hen that is said to hold the world's record for egg production, having laid a total of 281 eggs within 12 months, was recently sold for $800. The fowl, which is of the White Plymouth Rock variety, was purchased by the publishers of a poultry paper from a resident of Illinois.

FIGHTING THE MOTH WITH AUTOMOBILE SPRAYER

In Massachusetts, where hundreds of thousands of dollars have been spent in the fight to exterminate the gypsy moth, every scientific and mechanical means available have been used in the campaign. Among the spraying devices developed by the state authorities, one of the most successful has been this automobile sprayer. It will throw two streams of moth-destroying liquid into the topmost branches of the highest trees. The nozzle men stand on the flat, railed-in top of the tank, the truck stopping or moving slowly along as tree after tree is sprayed.

The solution sprayed upon the foliage during the period in which the moth caterpillars feed upon the trees is composed of about 10 lb. of arsenate of lead to 100 gal. of water.



An Automobile Sprayer Used in Massachusetts in Destroying the Gypsy Moth

"POWDER MONKEY" SHOOTS UP SNOWSLIDES

A Swedish "powder monkey," an expert in handling explosives, blasted a heavy snowslide along a western railway line by welding together three steel bars, each 1½ in. in diameter, and forcing them through the snow almost down to the track, or to a depth of about 35 ft. The hole made by the steel bars was loaded with 62 kegs of blasting powder and five dynamite cartridges of about 40-per-cent strength which were exploded by electricity, with the result that a large hole was made to within a foot of the track. Three or four other holes were made, loaded and fired in a similar manner, enabling the rotary snowplows to clear the slide in a few hours' time.

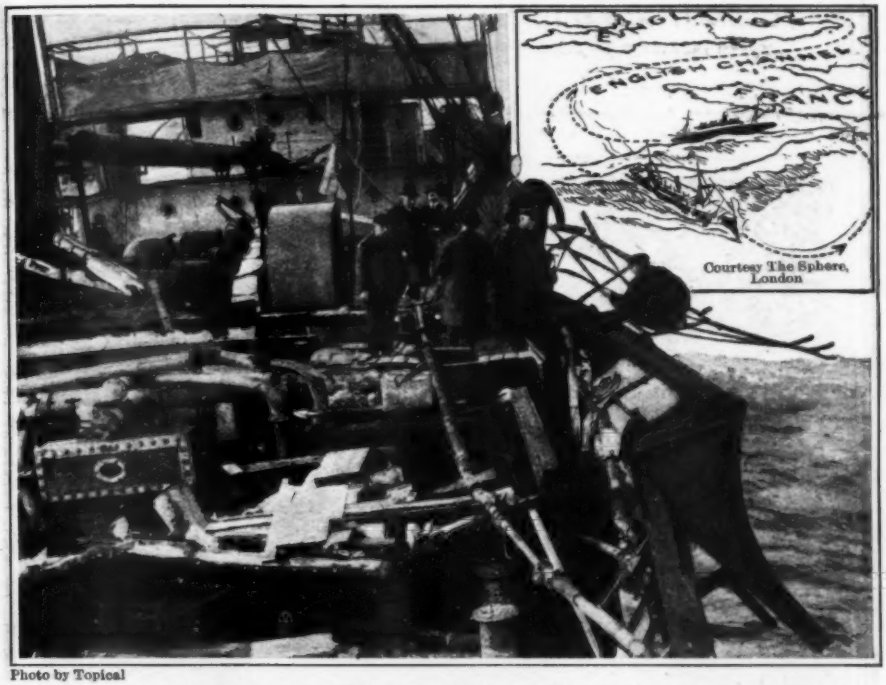


Photo by Topical

English Liner "Narrung" after Conflict with Mighty Waves, and a Diagram Showing How She was Forced Back to Port

GREAT WAVE OVERWHELMS ENGLISH LINER

Compelled to return to port a battered and waterlogged ship with her deck showing terrible havoc, nevertheless afloat and without the loss of a single life, was the experience of the English liner "Narrung" as the result of having encountered a terrific gale near Ushant Island off the northwest coast of France. Slightly south of this danger spot the vessel met with some very high seas, one of which is described as being 70 ft. high, bursting full upon her deck and causing the wreckage shown in the illustration. Rather than continue the 90 minutes' battle against such fearful odds, the liner was turned and headed back to port.

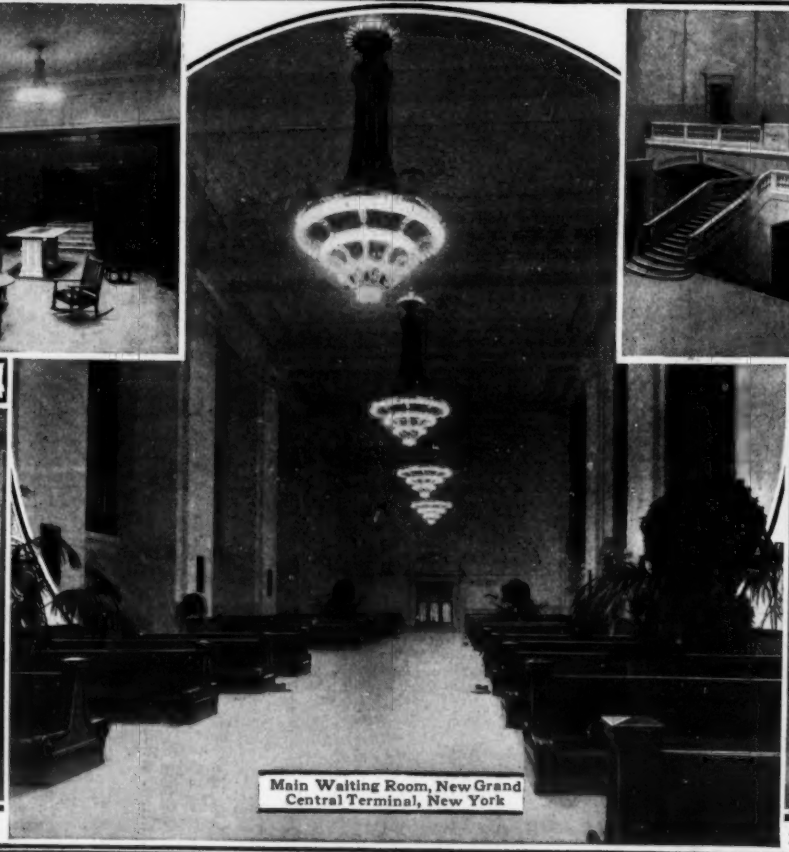
GAZELLE TAKES REVENGE ON ITS DESTROYER

This python was found dead on a farm near Buluwayo, in South Rhodesia, after having swallowed a gazelle, the horns of which had cut through the snake's skin. A day or so before the snake was found, it had been seen struggling with a gazelle along the bank of a near-by river.

Python Killed by the Horns of a Gazelle It had Swallowed. The Protruding Horns are Clearly Shown

A Corner of the Ladies' Waiting Room

Train Entrance on Suburban Level



Main Waiting Room, New Grand Central Terminal, New York

Photo by Paul Thompson
Grand Stairway to Concourse

Information Booth on Suburban Floor

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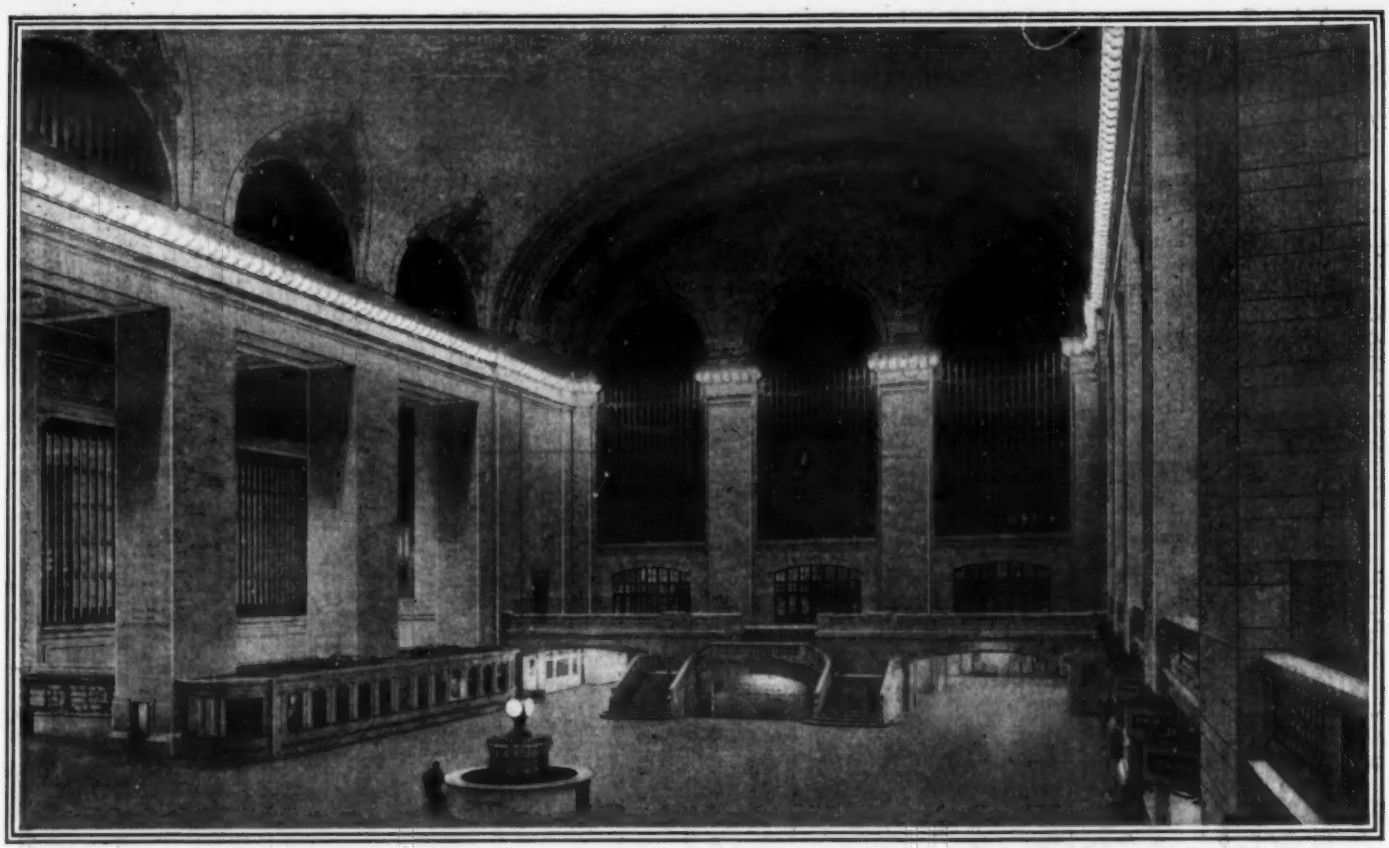
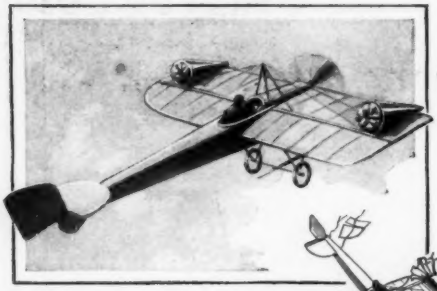


The New Grand Central Terminal, New York, the World's Largest Railroad Station, Contains 67 Tracks, Totaling 33 Miles. The Picture Shows the Main Concourse

PARACHUTES FOR AEROPLANE AS WELL AS AIRMAN

The energies of practically all the inventors of parachutes for airmen have been directed toward the development of a device for the airman alone, the aeroplane itself being allowed to drop to earth unhindered. Parachutes for the whole aeroplane have just been designed by a French inventor. Two folded parachutes, contained in cone-shaped receptacles, are attached to the wings as near the ends as possible. By means of a simple mechanism, operated by the movement of a small hand lever, these parachutes are pushed out of the containers, after which they are claimed to open freely, no matter in what manner the aeroplane may be falling. All the airman has to do is to hang on to the aeroplane.



The Parachutes in the Containers on the Wings of the Aeroplane

An Actual Demonstration of the Operation of the Parachutes

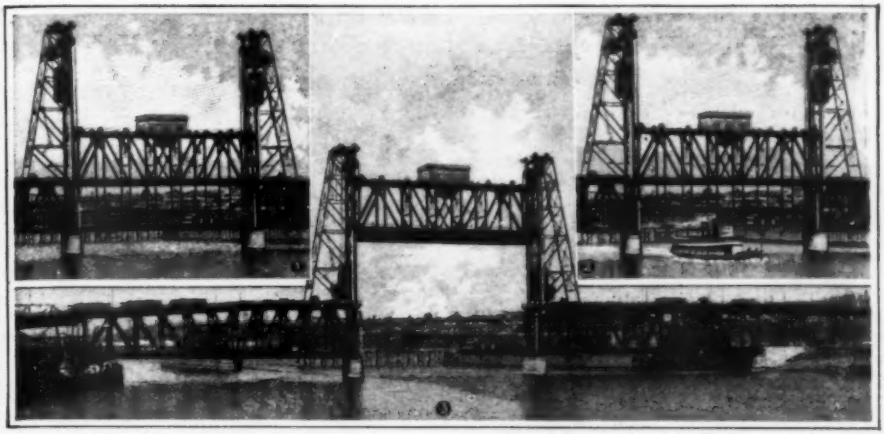
AUTOMOBILE THAT "BUCKS" LIKE A BRONCHO

A bucking automobile has recently been patented by a Chicago inventor. It is intended to be used for amusement purposes only. The wheels are not centered on the axles, but set eccentrically and the front wheels may be revolved independently of the rear wheels, so that a wide variety of vertical motions may be given to the body of the car. By alternating the eccentricities between front and rear, the result is a series of plunges or "bucks" not unlike the action of a bucking horse. The device is particularly designed for use in amusement parks. The patentee makes no claim of high speed with this invention.

DOUBLE-DECK LIFT BRIDGE OF IMMENSE SIZE

What is probably the largest double-deck lift bridge in the world and the only one having a movable lower deck, which may be raised enough to clear the top of all vessels requiring not over 70 ft. clearance without interfering with the traffic on the upper deck of the bridge, has been built by the Oregon-Washington Railway and Navigation Company across the Willamette River, at Portland, Ore.

The bridge has two decks, the lower being used for a double railroad track, and the upper contains double tracks for street cars; also two sidewalks and wagon roads. The total length of the structure, from approach to approach, is 2,500 ft.; each of the approach spans weighs 6,500 tons and more than 9,000 tons of steel were used in the bridge proper. The concrete piers, which support the spans, were sunk in bedrock 60 ft. below the surface of the water, measure 50 by 90 ft. and are 120 ft. high. The height of the central towers is 243 ft. to the top of the sheaves, and 363 ft. from the base of the foundation, or approximately as



Double-Deck Lift Bridge: 1, Both Levels Down; 2, Lower Level Partly Raised; 3, Both Levels Raised

high as an office building of 30 stories. The lift span, which is 250 ft. in length and weighs, with its machinery, about 2,500 tons, is raised to a height of 140 ft. above the high-water line by means of 2¼-in. steel cables having a breaking strain of many thousand tons. The double-deck lift span is raised and lowered by electric motors, and special devices are provided for automatically controlling the lift at any height in case an accident should occur while it is in motion.

DEATH RATE OF MINE RESCUERS

Two of the 24 experienced mine rescuers of the United States Bureau of Mines lost their lives while attempting to save imprisoned miners during the past year, and seven others were overcome by poisonous mine vapors and were rescued only after the most heroic efforts, according to a report issued by the government. In the period of one year 40 entombed miners have been rescued directly through the efforts of the bureau's men and perhaps as many more by individual miners who were trained in rescue work by the Bureau of Mines. Although the death rate is 80 out of 1,000 men employed by the bureau, the high mortality does not deter miners from entering the dangerous business.

DOG'S DINING ROOM IN ENGLAND

The illustration shows a section of the dining room that a restaurant proprietor of Chelsea, England, has provided for the dogs of those who frequent his place of business. Three pence (or six cents) is charged for each dog's meal.

Dog's Dining Room Operated by a Café Manager at Chelsea, England

¶Denver is said to use more electric lighting in proportion to its population than any other city in the country, the amount being 3 cp. per head.

Courtesy The Sphere, London

Zulu Orchestra About to Make Dance Music

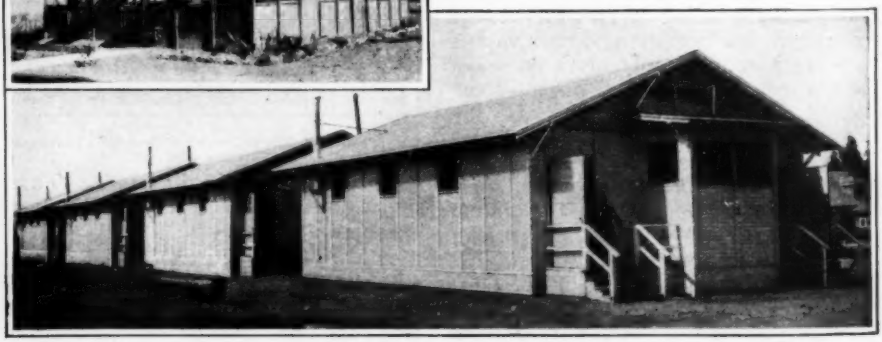
PRIMITIVE BUT POWERFUL ZULU ORCHESTRA

The primitive but powerful Zulu orchestra here shown is about ready to provide dance music for the natives of Northern Nigeria, who, when work in the mines is suspended, are accustomed to holding dances on Sundays. Hundreds of the Zulus, usually clothed in war attire, participate in these festivities which frequently continue for 12 hours and, by the end of this time, many of the natives taking part collapse from utter exhaustion.

PORTABLE SCHOOLS FOR TEMPORARY USE

Los Angeles is making use of a system of portable school buildings which is very practical, especially for rapidly growing cities. When overcrowding threatens some particular school building, it is a simple matter to add two or three class rooms by erecting the portable buildings on the school grounds or upon some conveniently located vacant lot. One of the Los Angeles schools is now making use of eight

A Portable School Used in an Arizona Town



Four Portable School Buildings in Los Angeles

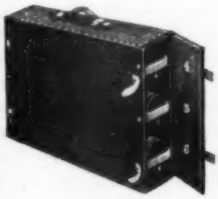
such buildings, which stand upon a lot directly across the street from the permanent structure.

The portable school buildings are about the size of the ordinary class room, and, although of light construction, are comfortable and well heated. They are collapsible, the largest sections being so small as to be easily handled by two men. The sections are bolted together, and it is possible to assemble or take down one of the buildings in a few hours.

A somewhat similar type of portable school, provided with flaps which can be lifted for ventilation, is being used in an Arizona town.

DYNAMITE CARRIER MADE ON "THERMOS" PRINCIPLE

The expediency of keeping dynamite from freezing in cold weather, particularly during the time it is being taken from the magazine to the place of use, has resulted in the invention of a nonfreezing carrier constructed on the principle of the thermos bottle. When dynamite is placed in the bottles or tubes, of which there are three, and the corks are firmly inserted in the ends, it will remain unfrozen for at least 12 hours, even when the carrier is exposed to a temperature considerably below zero. Before placing dynamite in the tubes the carrier is placed in a room having a temperature of 65 deg. F. or higher, and the corks are withdrawn for at least five minutes.



THROWING BIG BOULDERS WITH STEEL BUCKET

Throwing immense boulders with an "orange-peel" steel bucket, as a baseball is thrown with the hand, is frequently done with modern devices for excavating and rehandling rock, gravel and dirt. The construction of the bucket, which is operated by steam or electric power, is such that large boulders are quickly picked up and cast to one side of the excavation with ease, the contents of the bucket being released while in midair, thus materially increasing the amount of work that may be accomplished by the apparatus.

Throwing a Boulder with an "Orange-Peel" Bucket

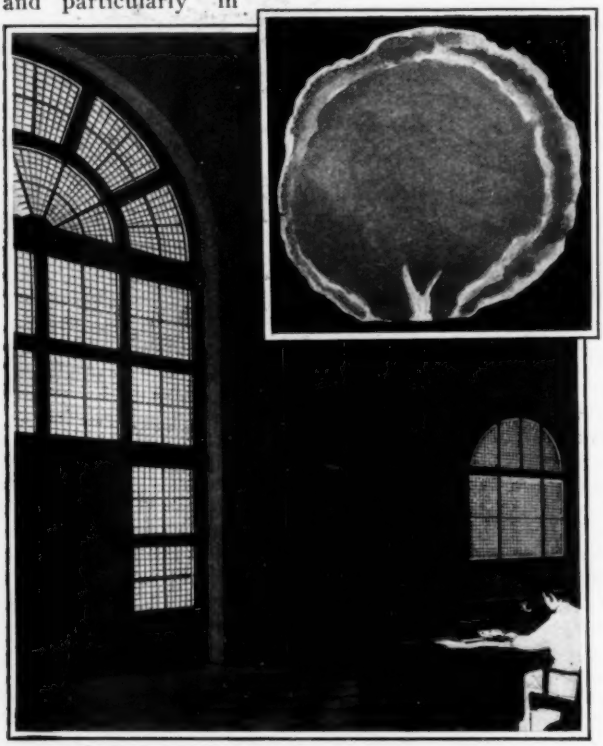
NEW TROWEL FOR STUCCO WORK

A new trowel for the application of rough-cast stucco has been patented by a Minnesota contractor. The open-work construction of this trowel causes it to pick up and throw the stucco on the walls in small dabs.

¶ More than $40,000,000 worth of agricultural implements were shipped from the United States to foreign countries in 1912.

THE SEA-SHELL WINDOWS OF THE PHILIPPINES

Sea shells are used as generally for window panes in the Philippines, and particularly in Manila, as is glass in this country, and the effect of tropical sunlight filtering through the silvery grayness of the shells, softened and gentle, is magnificent. The windows in the main entrance of the Philippine General Hospital, Manila, are probably as fine a modern example of the use of the sea shells as can be obtained. The sea-shell windows may also be seen at their best in the old churches.



Kapas-Shell Windows in the Main Entrance of the Philippine General Hospital, Showing the Soft Sunlight Effect

Manila alone uses in the neighborhood of 5,000,000 Kapas shells each year for windows. The largest-sized shells will square about 3 in. These sell for from $4 to $5 per thousand, according to quality. Shells that will form panes of about 2 sq. in. sell for anywhere from $1.50 to $3 per thousand, and are used for ordinary purposes, in dwellings, stores, and the like. Tests prove the shell panes to be much stronger than glass.

CAMEL'S-HAIR BELTING USED MANY YEARS

A new mill at Milton, N. H., is to be equipped throughout with camel's-hair belting because the shafting and machinery of the old mill, which was recently destroyed by fire, were run 24 hours daily for 10 years with such belting, and it was still in excellent condition when the mill burned. This type of belting is used to a considerable extent in tanneries and in mills where steam and acid fumes abound. It appears to be as impervious to moisture and acids as is a camel to the scorching rays of the sun on the great Sahara Desert.

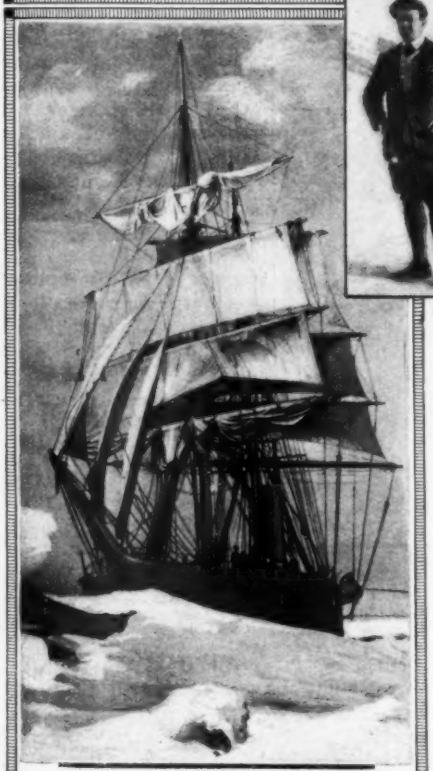
SIXTEEN-INCH GUN BUILT FOR GERMAN NAVY

Although there seems to be no probability that any of the German ships now building will be equipped with 16-in. guns, it is stated that such a gun, firing a projectile weighing close to a ton, has been constructed and is undergoing tests. Such a gun would be several sizes larger than the most powerful type at present used in any navy. The latest of the German battleships to be launched is designed for nothing heavier than the standard 12-in. gun.

SCOTT EXPEDITION PROVED VALUE OF MOTOR SLEDS

One of the Motor Sledges of the Scott Expedition, Photographed in the Antarctic

Captain Scott at His Winter Quarters



Photos by Paul Thompson

The "Terra Nova," Captain Scott's Combination Sail and Steamship, Caught in the Ice

The value of motor sledges in arctic explorations was demonstrated by the success of Capt. Robert F. Scott's expedition to the South Pole, on which motor vehicles and Siberian ponies were depended upon for transportation in addition to the customary dog trains. Captain Scott's diary, found with his body where he perished in a blizzard on March 29, 1912, on his way back from the Pole, which he had reached on January 18, refers in several places to the service rendered by the motor sledges. The motors found unexpected difficulty in traveling over sea ice that was partly covered with snow, but nearer the Pole, where the snow was thickly packed, succeeded in hauling trains of supplies and, according to Captain Scott, placed the possibilities of motor traction beyond question. The trail left by the motors was followed by the commander of the expedition to a point less than 10 deg. from the Pole, where the motors had to be abandoned because of the overheating of the air-cooled engines.

NATURAL-GAS EXPLOSION WRECKS DWELLING

The destructive force of natural gas was demonstrated in the wrecking of a house in Cincinnati from a gas explosion in the cellar, following a small fire. The family escaped early, but when the firemen went to the cellar with their lanterns, a terrific explosion lifted the building from its foundation and blew out the sides and front. The upper story settled back on the foundation walls in a half-collapsed condition. Four firemen were buried in the ruins and were dug out unconscious.

Natural-Gas Explosion Wrecked This Cincinnati House

¶A barrel of oil started west from Chicago, February 12, in a race around the world to settle a $1,000 wager that it would reach Cleveland, Ohio, by the last of May.

CREATION OF SUBSTANCES FROM ELECTRIC ENERGY

That matter may be created out of energy is seriously admitted as a possibility in the light of recent discoveries and experiments by such eminent scientists as Sir William Ramsay and Prof. Norman Collie.

In investigating the contents of used X-ray bulbs, Sir William Ramsay recently found traces of helium, the existence of which could not be explained. Professor Collie independently came to the conclusion that if cathode rays are passed through pure hydrogen gas in a certain manner there is present in the hydrogen tube considerable quantities of neon, which is one of the rarer elements of the atmosphere, and by some change of conditions the element helium is substituted for neon.

"Inasmuch as there is certainly no helium or neon in the bulbs," says Sir William Ramsay in an interview in the London Daily Mail, "and as the possibility of their entrance from the outside air, which contains them, was excluded by carefully devised experiments, the only conclusion which can be drawn is that these elements are the product of some action going on in the bulb; either the transmutation of the metal of the cathode, or of one of the numerous elements present in the glass, into neon and helium; or that hydrogen is thus converted into both of these gases; or that the electricity itself, in the form of electrons, gives rise to the birth of these elements. In short, either the

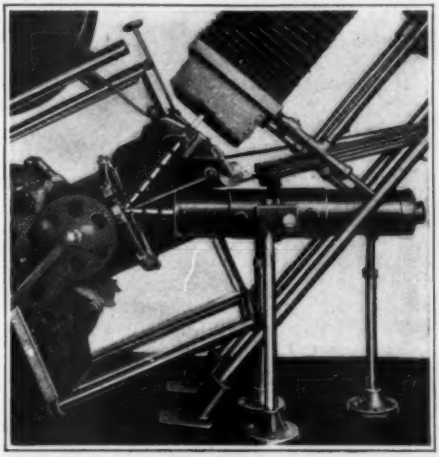
transmutation of one element into another, or the creation of an element from electricity. This points to a way for a change of one form of matter, supposed to be incapable of it, into another.

"The importance of the discovery is that we have deciphered another line in the book of nature and have opened the door to further discoveries. There may be commercial consequences; there probably will be. We are on the threshold of an entirely new departure in scientific investigation."

PROJECTS MOTION PICTURES THAT DO NOT FLICKER

An improved type of moving-picture machine which projects perfectly colored pictures without even the faintest suggestion of the flicker which causes eye strain and consequent disorders of the nervous system, is so constructed that the film moves continuously without interruption, there being no stopping or jerking, and no dark periods between pictures.

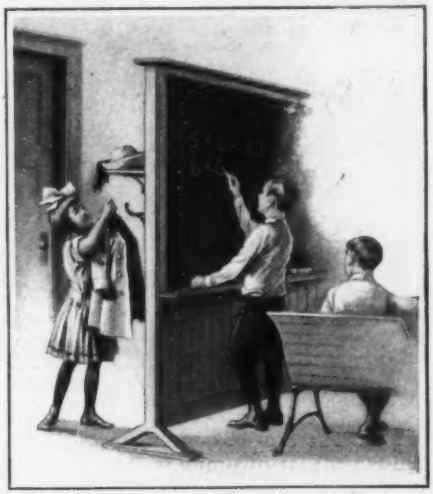
The flicker is done away with by directing the light through the film against revolving mirrors, which rock up and down in such manner that a continuous picture, instead of a series of snapshots, is projected through the lens onto the screen. The construction of the machine is such that the arc light cannot set fire to the film when the latter is not in motion.



Motion-Picture Projector That Eliminates the "Flicker"

CONVENIENT ARRANGEMENT OF SCHOOL CLOAKROOM

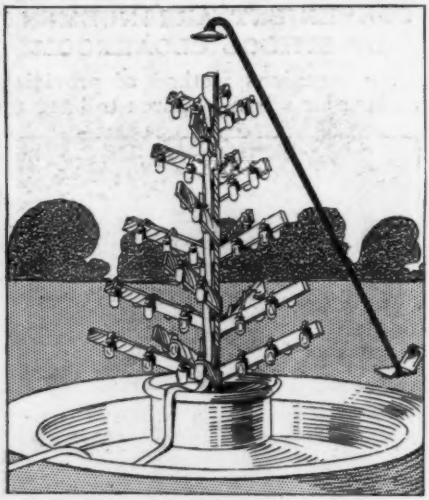
An ingenious method of providing a place for school children to hang up their hats and wraps out of sight of the pupils when in their seats, and at the same time always under the teacher's eye, so that petty thieving and other disorder in the cloakroom can be detected and checked, was originated in a school at Akron, Ohio, and has been adopted in schools elsewhere. The cloakroom is separated from the schoolroom proper by a partition 6 ft. high, set out a few feet from the blank wall of the room. The hooks for clothing are placed on the back of this partition, while on the other side is a blackboard visible from every part of the schoolroom. The partition extends from the back of the room only part of the way to the teacher's desk, so that the teacher, facing the pupils, can see what is going on in the cloakroom and the schoolroom at the same time.



Partition Forms Cloakroom and Provides Blackboard Space

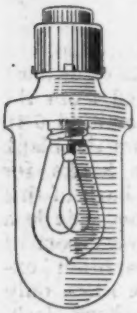
ELECTRIC ICE FOUNTAIN ON CHICAGO BOULEVARD

At the north end of Grand Boulevard, Chicago, is a fountain which was



The Framework, Showing Method of Hanging the Lamps and Obtaining the Water

useless during the winter months until the South Park Commissioners decided to convert it into an "electric iceberg." The remarkable beauty of the result is shown on the opposite page. The method of its construction is so simple that it can be duplicated easily and inexpensively wherever the weather remains at the freezing point for any considerable time.



Globe-Incased Lamp

To a 4 by 4-in. upright, about 30 ft. in height, scantlings were attached so as to project on all four sides in somewhat the same manner as the branches of a tree. This was erected solidly in the fountain basin. A lead-covered electric cable was strung on the upright, branch lines run out on the projections, and 16-cp. lamps suspended from each branch. The lamps were incased in "vapor-proof" protective globes, which are also waterproof and not only protect the lamps, but prevent the heat from melting the ice which soon solidly surrounds them. The water was piped through an ordinary garden hose to a length of iron pipe, propped at an angle so as to reach 2 or 3 ft. above the top of the upright. This pipe was bent at the top to discharge downward, and provided with a head of the type used on sprinkling cans.

Only 30 electric lamps were strung on the framework of this fountain, and all where they would chiefly illuminate the southern side, which faces the boulevard. In zero weather the ice formed in sufficient proportions to incase the upright and projecting arms completely in less than a week. A fine spray of water was kept constantly flowing from the sprinkler nozzle as long as freezing weather lasted.

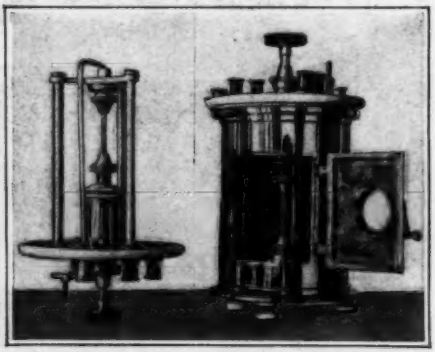
TRANSCONTINENTAL ROAD TO RUN BY ELECTRICITY

The first important electrification of a steam railroad in America, with the exception of such local applications as the suburban trains out of New York and a few tunnel equipments, is to be undertaken at once by the Chicago, Milwaukee and Puget Sound Railroad, which is preparing to equip 450 miles of its transcontinental line for electric traction. Electric locomotives taking power from overhead wires will probably be used in the sections where the new power is to be adopted, in Montana and Idaho. The power is to be furnished by the Great Falls Power Company of Montana, which has obtained permission from the United States government to use some of the water now going to waste in the government reservations in that section. The annual coal bill of the railroad amounts to $6,000,000, without counting the cost of transportation over its own lines. It is expected that the electrification will reduce this expense very materially.

The Electric Iceberg; a Novel and Striking Winter Park Decoration

TALKS BY WIRELESS PHONE ACROSS MEDITERRANEAN

A wireless telephone system that is attracting much attention among European scientists is the invention of an Italian engineer. Details of the mechanism have not been received in America, but it is said to operate substantially on the principle of the wireless telegraph, and it is claimed that conversation has been carried on by means of it between Rome, Italy, and Tripolis, Africa, a distance of about 650 miles across the Mediterranean.



Wireless Telephone Invented by Italian Engineer

BIG PRIZE FOR AUTOMATIC TRAIN-STOPPING DEVICE

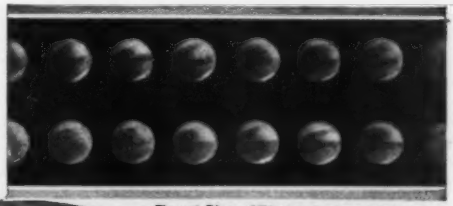
A prize of $10,000 has been offered for the invention of the best automatic device that will safely stop trains disregarding fixed signals. The reward will be paid by the New York, New Haven and Hartford Railroad on the order of the Interstate Commerce Commission, the Railroad Commissioners of Massachusetts and the Public Utilities Commissioners of Connecticut.

¶A recently cast propeller, 18½ ft. in diameter and weighing 24,531 lb., is said to be the largest ever made in this country. It is four-bladed and made of manganese bronze.

CANALS OF MARS INDICATE LIFE ON THE PLANET

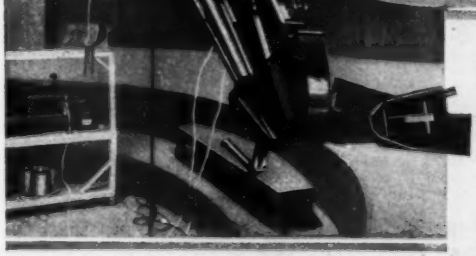
Investigations recently conducted upon an elaborate scale at the great observatory of Flagstaff, Ariz., prove to the satisfaction of many astronomers that the network of canals on the planet Mars is evidence of mighty efforts on the part of the Martians to preserve the fast-diminishing supply of water. The telescope has revealed that Mars is evidently a world of unusual beauty, but bearing signs of great age; a planet inhabited by intelligent beings, but a world which has reached the period when its seas have practically dried up. The heretofore startling claims of Prof. Percival Lowell, who was one of the first scientists to insist that Mars is the abode of a race of highly civilized people, are now being ably supported by Prof. James H. Worthington, another noted scientist, who says that there can no longer remain any doubt of the existence of canal builders on Mars. The same authority also declares that the construction of these canals is made comparatively easy because the Martians have no mountains to contend with. In another section of his report on this interesting subject, Professor Worthington says: "Assuming that the Martian atmosphere exerts a pressure of 2½ in. of mercury upon the surface—and it can scarcely be greater than this—Lowell has shown that water would boil at a temperature of 111 deg. F. As the solar energy falling on Mars is certainly not less than that which heats the rocks of the Sahara to at least 130 deg. F., it is clear that evaporation is much more rapid there than here; and, consequently, water traveling in an open channel would evaporate long before it reached the tropics of the planet, a journey which we know occupies several weeks. It is, therefore, probable that the water is carried in something

akin to pipes, and this is rendered the more plausible by the fact that the water does not flow naturally but is driven, a conclusion to which the shape of the planet has led us." The professor further declares that, "on account of the weakness of gravity on Mars it is probable that, though water may be scarce, yet the commoner parts of the earth's atmosphere may be present there. Among these gases are those which make life possible here, namely: water vapor, oxygen, nitrogen and carbon dioxide. It appears, therefore, that we are justified in concluding that the atmosphere of Mars may be like our own, though less dense, and that it is disappearing gradually."



Exact Size of Photographs of Mars Taken through Telescope

The Planet Mars, Showing the Network of Canals



Photographic Telescope by Which Pictures of Mars were Made

Escaping from a Building in the Same Way a Spider Drops by Its Thread

A "TAPE-MEASURE" FIRE ESCAPE

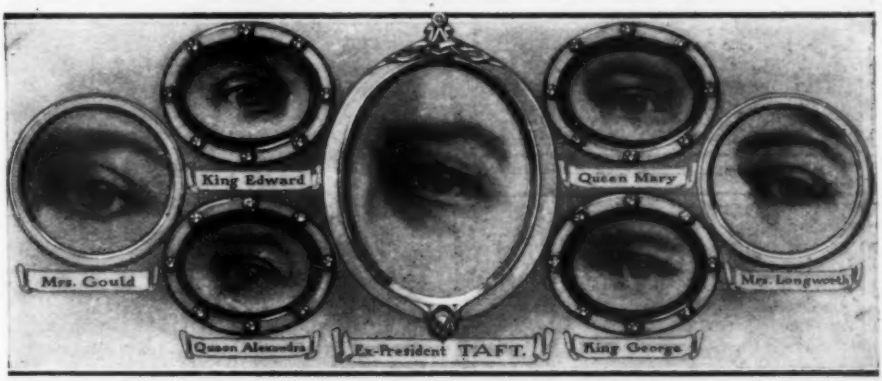
When a spider wishes to drop from its web in a tree or other elevation it spins a thread to support its descent, and this, figuratively speaking, is just what the user of the "tape-measure" fire escape does in descending from a fire-swept building.

This remarkable fire escape consists of a narrow band of steel tightly rolled upon a spool contained in a casing. In using the device, the end of the tape is made fast at the point from which the escape is to be made, a leather belt, attached to the spool casing, is fastened around the waist, and the user drops to the ground, regulating the speed at which the tape unwinds by means of a clutch device.

The efficiency of the device was tested recently from the fourth floor of the firemen's drill tower in Los Angeles, the drop being 200 ft. A tape of sufficient length and width is being constructed for a demonstration from the tower of the 55-story Woolworth building in New York.

INVISIBLE AEROPLANE MAY BE DEVELOPED

The United States War Department is experimenting with a transparent material for covering aeroplanes which is said to render the machine almost invisible in the air at a comparatively low altitude. The new substance, which has also been tested by Austrian army fliers, is in the form of a semi-liquid enamel, which dries into thin sheets that are almost colorless, flexible, and tough, and while resembling celluloid in appearance, is noninflammable. It is claimed that this substance is lighter and stronger than canvas. Besides aiding the airman to conceal his whereabouts, an advantage claimed for machines covered with this new material is that the occupant can see both surfaces of his planes, and keep an eye on every wire and bolt, and, in the case of monoplanes, that it is much easier for him to observe the land over which he is traveling.



Portraits of the Eyes of Well-Known Persons Painted on Ivory by an English Artist

PORTRAITS OF THE HUMAN EYE REVEAL CHARACTER

Painting portraits of the human eye is an interesting revival of a very ancient custom by Mr. Alyn Williams, President of the British Royal Society of Miniature Painters. Mr. Williams recently visited America and painted from life pictures of the left eyes of ex-President Taft, Mrs. Alice Roosevelt Longworth, Mrs. George Gould, and other prominent Americans. Queen Mary of England had painted for her husband, King George, a set of sleeve links, on the four faces of which were painted the pictures of her own eye, that of the king, the eye of the late King Edward VII, and the eye of Queen Alexandra. These cuff links, like the other eye portraits referred to, are painted on ivory, and are placed behind a crystal lens and mounted in gold and jewels. It is claimed by the artist that the human eye gives a complete character index of the individual and that a recognizable portrait can be made in this manner. The ancient Egyptians and some of the forgotten races of Southern Asia carried amulets bearing portraits of the human eye as a charm against evil, but it is not claimed that these modern miniatures have any such magic effect.

CABOOSE UP-ENDED WITHOUT BREAKING COUPLING

In an end-to-end collision between two freight trains in the yards of the Southern Pacific Railroad at Benson, Ariz., the caboose at the end of one train was up-ended in the manner shown without even breaking the coupling that connected it with the flat car to which it was attached. The flat car remained solidly on the track, due to its heavy load of cement pipe. The steel gondola of the other train shaved off the bottom of the caboose slick and clean.

The Coupling Attaching This Caboose to the Flat Car was Not Even Broken

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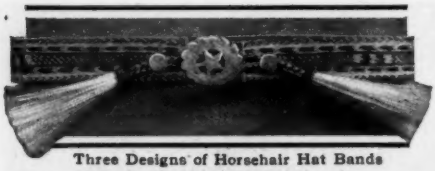
¶A steel gasoline motorboat for pilot service at Port Said is being built in France. It will be 68 ft. 9 in. long and develop a speed of 13.8 miles.



Three Designs of Horsehair Hat Bands

Weaving Hat Bands

Louis Eytinge, a Convict Who Made a "Business" of the Horsehair Weaving of Arizona's Prisoners

CONVICT ESTABLISHES CURIO TRADE

Before Louis V. Eytinge, now serving a life sentence in the Arizona state prison, entered that institution the prisoners, or at least the Mexicans, Indians and cowboys among them, sold to the visitors for a few cents the hat bands, watch fobs, and other trinkets, they wove out of horsehair. At present, through the business ability of Eytinge, who was struck by the commercial possibilities of this craft, a regular business has been organized which brings in an annual profit of $5,000. Eytinge's share of the profits as business manager goes by his own wish to the State of Arizona, and he has in this manner repaid the costs of his trial and is now paying off the reward given by the state for his capture.

It became possible for Eytinge to put his ideas into practice when the prisoners were removed from Yuma to the modern prison at Florence and a humane prison administration was inaugurated under Governor Hunt. He first set about standardizing the output of the voluntary workers and then placed samples with wholesale dealers in curios. A few orders followed and by degrees a substantial business was developed. There is nothing haphazard about the business methods employed. Even the stationery used by Eytinge shows attention to detail, and a postoffice box is given as the address, so that the casual correspondent will have no reason to suppose that he is dealing with a prison inmate.

LAUNCHES LIFEBOATS FROM EITHER SIDE OF SHIP

A method of launching lifeboats, by which all the boats can be lowered from either side of the vessel, has been put into operation on the Channel steamers plying between Flushing, Holland, and Folkestone, England. The boats, instead of hanging from davits, rest on supports which are provided with wheels that travel on rails laid athwartship. Thus, if the vessel is careening to either side, all of the boats can be quickly rolled to the low side and launched in the usual manner. Or, in case of a severe storm, all the passengers can be taken off on the lee side with less danger of the boats being smashed.

COMMENT AND REVIEW

"THE singular fact," said President Woodrow Wilson in a recent speech, "is that nothing is done in this country today as it was done twenty years ago." He was referring especially to political activity, but his statement, broad as it is — for "nothing" is a big word — applies literally to every branch of business, industry, science and art. *Nothing* is done as it was done when men still young were boys. And even most of the commonplace things of every day, that we accept as matters of course because we have always seen them about us, are so new that people now living remember when they were not.

Nothing is Done as It Used to Be

Only two or three years ago Edward Entwistle died in Iowa, and he, as a boy of sixteen, had fired the boiler for Stephenson's "Rocket," the first successful steam locomotive — so new is the railroad. As a boy I talked with people who had seen Fulton's "Clermont," the first steam-propelled vessel. Not long ago I met Charles Haswell, who was the first chief engineer of the United States Navy, and he told me of the tremendous opposition of Navy officers to the introduction of steam power for ships of war.

Such everyday things as the bicycle, the telephone, the phonograph, the typewriter, motion pictures, aniline dyes, automobiles, electric lights, gas engines, aeroplanes, submarines, roller skates, fountain pens, alarm clocks, safety razors, steel ships, barbed-wire fences, traction engines, gang plows and modern machinery generally — all these and a list a hundred times as long have come into existence in the lifetime of men who are still young. Only the other day I dined with the man who built the first electric railroad, and he is several years under sixty. Not long ago the magazines were full of wonderful stories about the new way of putting up office buildings that was being attempted in Chicago — by building a steel frame and filling in the walls afterward. And not long before that, the invention that made the "skyscraper" possible was brought out — the hydraulic elevator.

POPULAR MECHANICS MAGAZINE is in itself an example of how new everything is. Thirty, or even twenty years ago it could not have existed, for into its production go a dozen inventions and materials that were unheard of when we who are still young were children. Wood-pulp paper, that makes the modern popular-priced magazine possible, is a very modern invention. So are the high-speed presses, that take the paper from the roll and print both sides at once from electrotype plates, 96 pages at a time. So is the type-setting machine, that makes new type for every issue at half the cost of hand composition. So are many other machines that play important parts in the printing and binding and distributing of the magazine. But even if all these modern inventions had been available in the time of my grandfather, or yours, it still would have been impossible to produce Popular

Magazine Making Is a New Art

Mechanics Magazine for the lack of three other elements that are the essential things that make the magazine of today what it is.

First among these is dry-plate photography. Every kind of photography is new enough, for that matter. The very first person whose portrait was ever painted by the sun's rays was still living a year or two ago. But down to about thirty years ago the taking of photographs involved a dark-room close at hand, quantities of chemicals, bulky apparatus for the preparation and development of the old-fashioned "wet plates," and such long exposures that only "posed" pictures could be made — the "snapshot" was unheard of. Even with these handicaps, a few courageous and enterprising men succeeded in making remarkable pictures, but these successful photographers were few and far between. Now the dry plate and the film negative have put photography at the command of everyone, while fast lenses and high-speed shutters make possible photographs of aircraft in flight, machinery operating at top speed, every moving object as it looks in motion—pictures full of life and action that tell at a glance more vividly than pages of description, more accurately than the best artists could draw them, what the new world-wonders look like, how they are made, what they can do.

I SOMETIMES think that the greatest educational force in the world today is the film camera. The picture speaks a universal language that tells more at a single glance than the swiftest stenographer could put on paper in hours. The "picture writing" of primitive tribes is the oldest known means of recording facts. It survives in the Chinese alphabet, every character in which represents a distinct idea, a conventionalized picture — the character meaning "danger," for example, representing a girl standing on the edge of a cliff. But while few foreigners can master the intricate symbols of Chinese writing, any Chinaman intelligent enough to "press the button" can write with his camera a story that everyone in the world can read. And the untold millions of photographs, made literally from pole to pole, have done more, I believe, to educate the people of the present generation and broaden their mental horizons than any other one modern device. Few people can write a description of a ship, a machine, a natural phenomenon or a strange custom so graphically, completely and yet concisely that everyone who reads will see the thing described as the author saw it. Still fewer can draw a picture that will come anywhere near conveying a correct impression. But the hundreds of paid and volunteer correspondents of Popular Mechanics Magazine, in every part of the world, send us descriptions that need no translations, drawings that are as accurate as the processes of nature—news written with the camera in the only universal language.

The One Universal Language

The dry-plate photograph alone, however, even added to the mechanical devices for the production of magazines cheaply and in large quantities, would not have made the modern magazine possible. The photographs taken in the Civil War were practically

valueless to the periodicals of that day, because there was no way of reproducing them in print except by first redrawing them on wood and then cutting away the surplus wood and printing from the engraved block. First the artist lost some of the essentials of the picture, then the engraver hewed away part of the artist's work, as a rule, and the result was far from accuracy. The invention of process engraving eliminated the wood engraver and with him one source of inaccuracy. Then, about 25 years ago, came the half-tone process, that transfers the actual photograph to the printed page, with all its lights and shadows, details and outlines, tone gradations, distances and perspectives reproduced as the camera caught them.

BUT—this is the point I have been aiming at all along—all of these wonderful inventions could never have made a magazine like this possible if it were not literally and exactly true, as President Wilson put it, that "nothing is done today as it was done twenty years ago." *That* is the essential fact—that this age we are living in today is a *new* age, an age in which everybody, all over the world, is doing new things, interesting, important, wonderful. New devices, new methods, new machines to make new products, new proofs of the power of the human mind to conceive and the human hand to construct instruments with which to conquer the forces of nature and bring them to the service of humanity—these are the characteristics of the age we live in. Never have the creative forces of mankind moved so fast as in the lifetime of us who are now on earth. Never before have there been so many people in the world eager to know what the world is doing, and how it is doing it.

This Wonderful New Age We are Living In

When I was a very little boy a dear old aunt told me how, in her childhood, she walked three miles through the woods to a neighbor's to bring home fire in an iron kettle, because their own fire had gone out and the tinder was wet. Puzzled, I asked:

"Why, didn't you have any matches?"

"Nobody had any matches then," she replied. "Matches hadn't been invented."

It was a real shock to me. So far as I knew, matches had always existed. I could not conceive of a universe without matches, any more than the youngster of today can imagine a world without telephones, electric lights or automobiles. Youth seldom realizes that the commonplaces of today were the wonders of yesterday.

Think of that, you young people of sixteen or sixty, the next time you ride in an electric car, send a wireless to a friend at sea or take the elevator in a modern office building. Once you realize how truly wonderful are the everyday things you pass without a glance, you will find new vistas opening all around you—vistas down which you will gain new perceptions of the destiny of mankind, new inspiration to great thoughts, and a new conception of this big world of ours.

FRANK PARKER STOCKBRIDGE

Back of the New U. S. Paper Money, Which will be Smaller Than Present Currency

CAPTAIN AMUNDSEN'S CHICAGO MEDAL

The Chicago Geographic Society recently presented Roald Amundsen, who was first to reach the South Pole, with a gold medal, the obverse side of which shows the emblematic figure of Chicago, with the skyline of the city in the background. The reverse side of the

Obverse and Reverse Sides of Medal Presented to Amundsen by Chicago Geographic Society

medal has the seal of the society in the center, with laurel and oak on one side and corn and wheat on the other.

NEW MONEY TO BE SMALLER AND SIMPLE IN DESIGN

The new paper money to be issued by the U. S. Treasury will be 6 in. long and 2½ in. wide, instead of 7 in. by 3 in. as at present. On the backs there will not be a sign of a dollar mark or any figure of value, and no lettering except the "U. S. A." under the central figure. There is no background, and in the expanse of clear white paper the new money will display, it will resemble the paper money of European nations.

The pictures on the new money represent America enthroned between Peace and Prosperity, with Labor bringing his products to Prosperity and Peace dispatching Commerce to distribute America's commodities to the world. These figures were drawn from life by the artist, Kenyon Cox, a professional model serving for America and the artist's fifteen-year-old son for Commerce.

The same design is to be used for the backs of all denominations. For the face of the new money, only the one-dollar denomination has as yet been accepted. It will bear the portrait of George Washington in a medallion in the center and no other engraving except a simple scroll-work border and the value in each corner. Portraits of other presidents will be used on the other notes. Treasury officials expect that practically all the notes now in circulation will be replaced by the new ones within two years.

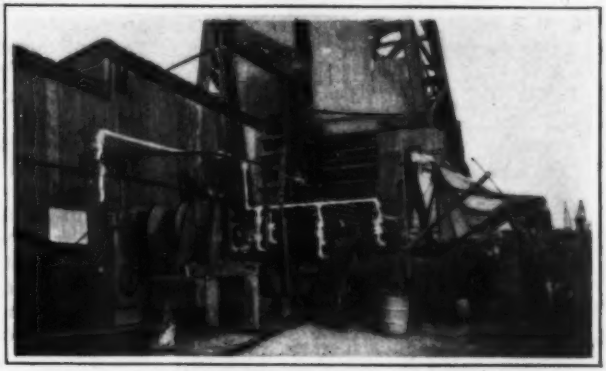
¶Forty-two per cent of the population of America lives in cities.

NATURAL GAS PROVIDING AUTOMOBILE FUEL

Natural gas as an automobile fuel is being experimented with in West Virginia, where the largest gas wells in America are located. The gas is compressed in seamless tanks, holding from 300 to 2,000 cu. ft., at a cost to the user of about 15 cents per 1,000 cu. ft. A well-known car using natural gas, on the Indianapolis speedway, made a mileage of 100 on 25 cents worth of fuel. The same car consumed 20 cents worth of gasoline in running 20 miles on the same track. A one-ton truck was driven 75 miles on the contents of two 300-ft. tanks without exhausting them. A comparison recently made by one of the largest automobile manufacturers between gasoline at 13½ cents a gallon and natural gas at 30 cents per 1,000 cu. ft., which were tested in the same 40 hp., four-cylinder motor, showed a cost of 20¼ cents an hour on gasoline and 3.6 cents on natural gas.

Natural gas is produced in 23 states, all the way from the Atlantic to the Pacific and from Mexico to Canada, and the compressed gas can easily be shipped in cylinders at a low cost. For three or four years natural-gas producers have been obtaining an excellent quality of gasoline from the natural gas itself and this fluid is now being marketed by producers in West Virginia, Ohio, Pennsylvania, Oklahoma, California, Colorado, Illinois, and New York. The method followed in the eastern gas fields generally is that of condensing the gas at a pressure of from 100 to 300 lb. to the square inch, which extracts the gasoline, and the gas is then led into pipes and used for heating and lighting purposes almost as readily as in its original state. From 2¾ to 3½ gal. of gasoline can be obtained from 1,000 cu. ft. of natural gas by this process.

A process recently adopted in California produces gasoline from natural gas by refrigeration. A chilling plant similar to that used in making ice subjects the gas to intense cold as it passes through a series of containers. By the successive lowering of the temperature rhigolene and other of the more valuable petroleum products are also given off as by-products, the rhigolene, which is extremely volatile, being utilized to obtain still lower temperatures.



A California Plant for Making Gasoline from Natural Gas

QUARTZ-CRYSTAL SPHERES

The quartz-crystal sphere recently given to the American Museum by J. Pierpont Morgan is said to be the finest specimen in America. It is a little more than 4 in. in diameter, of perfect proportions, and "water pure." The largest known crystal sphere, which measures 7 in. in diameter, is in the Green Vault in Dresden.

The crystal ball, which is an enviable feature in all beautiful mineral collections, is of great value when the size is large, as there is a rarity of quartz masses of desirable quality for their creation. The grinding of a mass of quartz into a ball by hand, as formerly done in the Orient, consumed much time, but skill, patience and hereditary

pride made up for any lack of labor-saving tools. The mass of quartz, at first rudely rounded into globular

Photo by American Museum, New York
Beautiful Crystal Sphere Presented to the American Museum of Natural History by J. Pierpont Morgan

form by chipping with small steel hammers, was rounded down to an even surface with powdered garnet or emery, held in cylindrical iron troughs. The final polish, transforming the dull surface into a lustrous mirror, is imparted by rubbing with bamboo, and with the hand dipped in rouge. When finished, the ball was usually mounted upon bronze waves, which bore it like a congealed drop of the water's spray. Modern mechanical devices have now shortened the laborious process of the Eastern workmen, and pieces of quartz are placed in semicircular grooves in huge grindstones, where they are held until the contour coincides with the rounded sides of the revolving mold.

Crystal gazing, as a supposed means of foretelling the future, has a very ancient history. It was widespread in the Orient, and the Assyrians, Hebrews, Greeks and Romans practiced it.

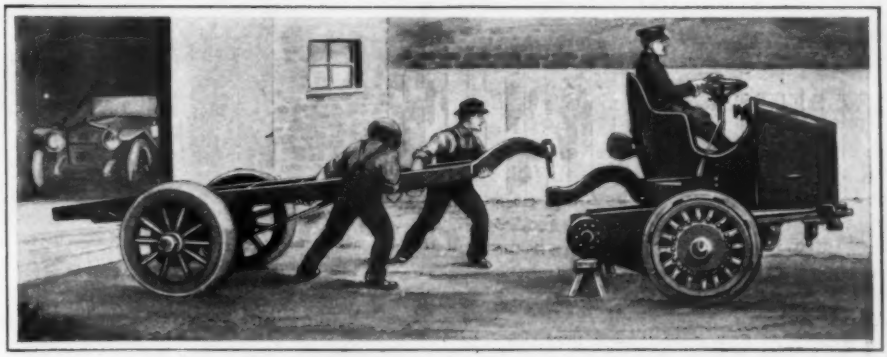
¶Seventy lives are lost annually through forest fires, according to the U. S. Forest Service.

LANGLEY MEDALS AWARDED TO CURTISS AND EIFFEL

The regents of the Smithsonian Institution at Washington recently awarded the Langley Memorial Medals for especially meritorious investigations in connection with the science of aerodromics, or flight with wings, and its application to aviation, to Gustave Eiffel, the French engineer who built the great tower in Paris that bears his name, and Glenn H. Curtiss, the American inventor and aeroplane manufacturer. This is the first award of the medals since 1908. Mr. Curtiss was chosen because of his development of the hydro-aeroplane and M. Eiffel for important laboratory researches in air resistance which he recently conducted. The medals will be presented at Washington, D. C., on May 6, 1913, the seventeenth anniversary of the first successful flight of a heavier-than-air machine, the invention of the late Prof. S. P. Langley, Secretary of the Smithsonian Institution.

PUTTING THE AEROPLANE TO COMMERCIAL USE

An effort to establish the practical value of the aeroplane as a commercial vehicle is being undertaken in England. Many airmen have carried small packages of merchandise from one city to another, but in most cases the transportation has been merely for some special advertising purpose and the trips have seldom been repeated. A tobacco company of Newcastle, however, has arranged with a local airman to make regular deliveries of tobacco and cigars to several towns in Northumberland and Durham. The airman uses a machine with a 60-hp. engine and has contracted to carry any amount of goods up to 200 lb. weight on his trips. The first delivery was made on February 10, 1913, and the plan was to have regular deliveries by aeroplane every other day. The particular firm making this contract suffered a great deal of inconvenience and delay in its deliveries during the recent railroad strike.



Connecting Up the Tractor Automobile with Its Trailer Section

FRONT-DRIVE MOTOR TRUCK OF UNIQUE DESIGN

A front-drive gasoline motor truck, the whole front portion of which, including the complete power plant, the driver's seat, etc., turns in steering, the rear portion being practically a trailer, has made its appearance on the automobile market. If desired, only the front portion of the motor truck need be purchased, along with a few feet of the forward end of the frame, so arranged that it can be attached to any kind of a vehicle after the front wheels of the same have been removed. This feature is particularly interesting in connection with converting horse-drawn fire apparatus into motor driven.

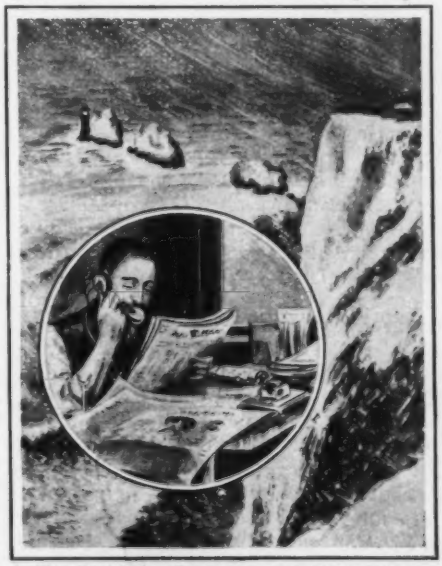
THE BARREL CONSUMPTION OF AMERICA

More than 150,000,000 barrels, kegs and circular packages are turned out by the cooperage industry of the United States each year, the heaviest consumer being the cement industry, with the flour business ranking next, closely followed by sugar. The barrel demand for molasses, oil, lard and pork is also enormous.

¶A permanent building, 80 ft. long, 45 ft. wide and 18 ft. high, with concrete walls only 2 in. thick, is being constructed in England and will be used for moving-picture shows.

LIGHTHOUSE KEEPERS GET NEWS BY PHONE

During recent storms along the English and French coasts the keepers of the lighthouse on the Needles, which is the name given a cluster of chalk-rock islands in the English Channel off the west shore of the Isle of Wight, were shut off from land for several days. The telephone, however, was in good working condition and the newspapers were read to them every day.



The Lighthouse Keepers on the Needles had Newspapers Read to Them over Telephone During Long Storm

SEAL CATCHING ON THE NEWFOUNDLAND ICE FLOES

By M. F. POWER

WHEN Peary picked Capt. Bob Bartlett and a crew of Newfoundlanders to man the good ship "Roosevelt" on the dash to the North Pole, he came to the right place to find men accustomed to fighting fierce battles with the icy seas. The fisherman of Newfoundland is a hardy composition. A traditional descendant of the bold English, Scotch, and Irish "deep-sea men" of Queen Elizabeth's day, he has lost none of the characteristics of those intrepid sailors who laid the foundations of Britain's colonial empire. To us of Newfoundland the call of the North has no unpleasant sound, and when the arctic floes sweep down the coast our fishermen are glad. For on those floes sport myriad seals, whose fat and fur are the source of great colonial prosperity.

The seal fishery begins about March 12. More than twenty ships, powerfully constructed and specially modeled to pierce the ice pack, now engage in the industry. In the olden times sailing ships were employed, and their traditions are still preserved in the ballads and folklore of the islanders. Many a tale, laudatory of the ancient vikings, is told for the emulation of the modern sealer. The old seal killers were a brave race, who overcame in an almost miraculous manner the difficulties of rafting ice, and returned majestically with bumper cargoes to receive the acclamation of their friends in their sea-girt villages. No returning Roman conqueror ever obtained the ovation of triumph with more enthusiasm than did the old-time colonial captain who came back from the gory icefield laden with the pelts of the seal.

Nowadays this fishery has lost much of its poetry, as modern equipment eliminates many of the sources of former dangers. Nevertheless there are occasions when the present-day sealers confront romantic situations and fascinatingly thrilling experiences.

Disasters causing loss of life have

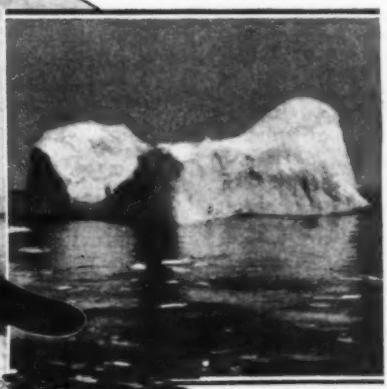
Discharging the Cargo of Seals and Skins at the Home Pier

Peeling the Fat from a "Harp" Seal Pelt

Seal Fishermen Leaving the Ship to Seek Their Unresisting Prey

Killing the "Harp" Seals on the Ice Floes

A "Whitecoat" or Baby Seal at Rest



The Peril of the Berg is Always Present

A Newfoundland Steam Sealer in the Ice

not been rare. One of the worst chronicled is the "Greenland" disaster. The "Greenland" had sent her men some distance from her on a fine morning. Toward evening a sudden snowstorm arose and the sealers in vain sought their ship. During the awful night that followed many perished from exposure. The bodies were recovered and brought to St. Johns.

Each sealing steamer carries a crew of two or three hundred men, according to her tonnage. The voyage lasts about a month for the successful ships and a couple of weeks longer for those which, having missed the main body of seals at the outset, must scour the ocean after the ice has broken up. When the ships reach the whelping ice, as the field is called where the young seals are born and grow, they often wait a few days before slaughtering in order to get the pelts well matured. It is simply marvelous to watch the rapidity of their growth. Within a few days the baby seal, called the "whitecoat," a few pounds in weight, develops into the prime young "harp," whose average weight is about 45 pounds.

Into the great patch of the young harp seal the captain sends his crew. Divided into watches, they take orders from the master watch. The seals are slaughtered with ease by a well-directed stroke of a staff and then collected on the larger ice pans to facilitate the loading on board. When the ship has her load panned the whole crew is called to the loading; then her prow is homeward set and she enters port with all flags flying. There is great rivalry among the men to be the first ship in, and on the land there is always great excitement when the first ship is signaled.

After the landing of the seals they are skinned and the fat is rendered into oil. The skins are mostly tanned in England, while the oil finds a ready market for lubricating purposes on both continents. The seal fishery is, after the cod fishery, the most valuable asset of our commerce and has been for many years a source of vast wealth to Newfoundland. Many think that the advent of the modern ice-crushing steamer with immense carrying capacity, will shortly cause an extinction of the seal.

Trained under such trying conditions the Newfoundland fisherman develops a constitution of iron. He cheerfully suffers hardships, and with bravery amounting to the reckless faces light-heartedly the colossal dangers of the storm and ice-bound seas.

PISTOL WITH LAMP FOR LIGHTING TARGET

The pistol here shown has a small electric lamp fastened lengthwise under the barrel and controlled by the trigger. The battery is contained within the handle of the weapon and the bullet strikes inside the circle of light cast by the lamp, thus making this type of firearm an especially desirable one to have around when burglars are in the house.

This Pistol Illuminates Its Target

¶Although great quantities of crude rubber are now required in this country, due to the automobile, the amount imported last year, valued at $100,000,000, was no greater in value than two classes of imported luxuries combined. The importation of diamonds and other precious stones for the year is valued at between $40,000,000 and $50,000,000, while that of laces and embroideries reached about the same figure.

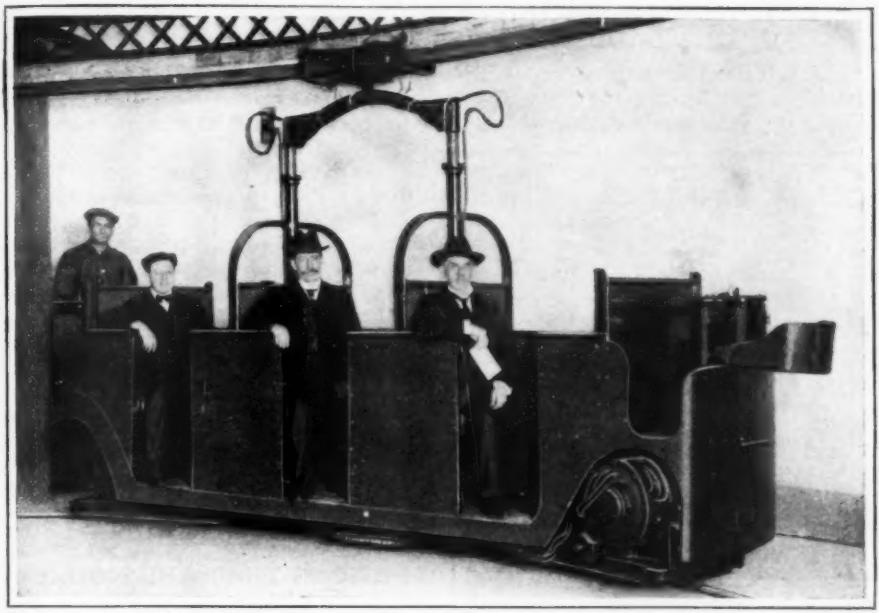


Photo by Harris & Ewing
Senators Williams of Mississippi and Swanson of Virginia Enjoying Their First Ride on the Monorail

THE SENATORS' MONORAIL IN OPERATION

The little monorail system in the subway connecting the Capitol at Washington with the building in which the Senators have their private offices is now in operation. The underground passage, which is shaped like an elongated "S," is 750 ft. in length. Until the installation of the electric monorail system the journey through the subway was made by automobile. The little car, which runs on a single rail and is kept upright by an overhead rail seats 12 persons.

PRISONER DEVISES STOLEN AUTOMOBILE ALARM

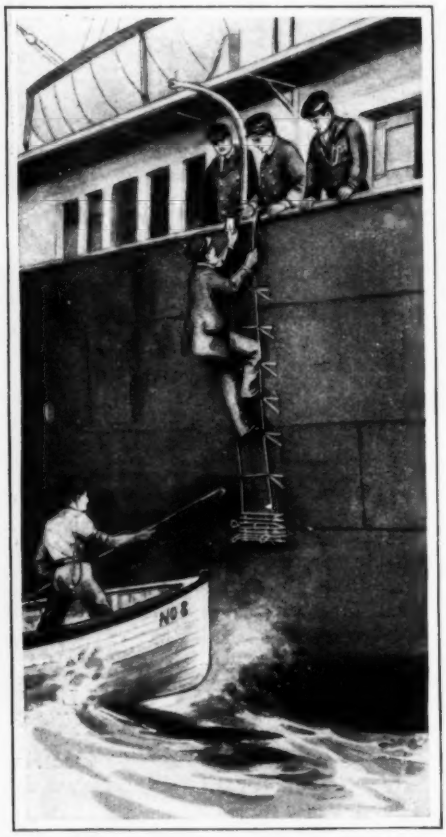
An alarm which sounds when a person attempting to steal an automobile tries to start the engine was devised recently by an automobile mechanician serving a term in the Denver jail. The device emits sirenlike calls for help the moment the thieving "joy-rider" attempts to crank the car. The inventor believes the racket will fill the thief with terror, as well as attract attention. The owner of the car sets the alarm in operative position when he leaves the car.

AN UNUSUALLY SMALL ELECTRIC HEATER

An exceptionally small electric heater of the type that illuminates as well as heats is shown in the accompanying illustration. Although weighing less than half a pound, it is not a toy, but a practical heater for bathrooms, small bedrooms, and for the cold corners of a large room. It is claimed to operate at a cost of but one cent an hour.

ADJUSTABLE-LENGTH JACOB'S LADDER

A Jacob's ladder that is easily adjustable as to length, the lower part folding up, has been constructed espe-



Jacob's Ladder That can be Used for Outside Access from Boiler Room to Deck

cially for Great Lakes shipping. It can be used, for instance, as an outside means of access from the engine-room port to the deck. The steps of this ladder are made of aluminum, and the hooks are bronze.

¶A gigantic scheme for utilizing the water power of Finland to supply electrical energy to St. Petersburg and its environs has been undertaken by the principal bankers of Russia.

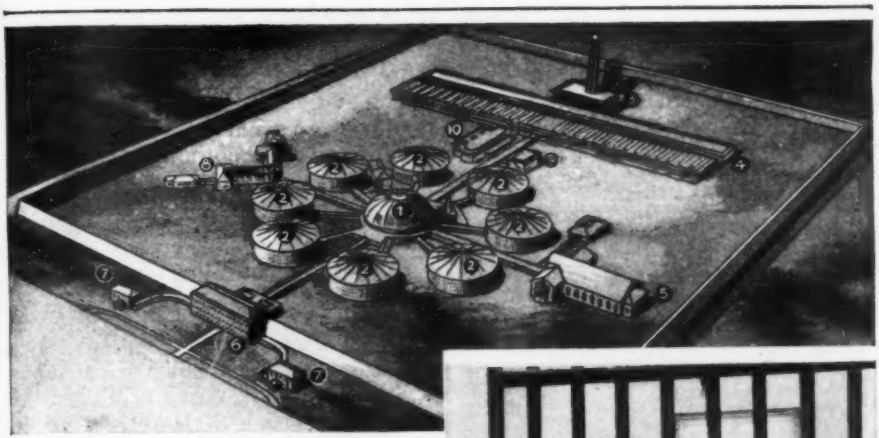
A PRESSURE SYSTEM OF FILTRATION

A new type of sewage-disposal plant, especially designed for glue factories, slaughter houses, tanneries, and the like, is provided with pressure filters. The sewage is pumped from a basin through these filters until the solid matter accumulates to a considerable thickness on top of the filter beds. Then the water is drawn back into the supply basin and compressed air is introduced to force out the remaining water and dry out the solid matter, which, thereupon, becomes a flexible cake on top of the filter bed. This cake is then rolled up and removed to a press to have any remaining moisture squeezed out. It may then be ground up and sold for fertilizer, chicken or hog feed, according to its composition.

PRISONS THAT ARE MODEL STRUCTURES

The new federal prison at Leavenworth, Kan., in which are housed prisoners of the United States, is a massive structure of steel and masonry containing 1,200 cells, each of which will hold two prisoners. The building of this great prison was begun 15 years ago and cost the government $4,000,000. More than 6,000,000 brick and several hundred tons of steel were used, and the masonry for the entire structure was made within the walls by the prisoners. Physical punishment is not administered in this prison, the corrective measures being limited to the wearing of certain uniforms and confinement in isolation cells where the inmates are given rock to be broken.

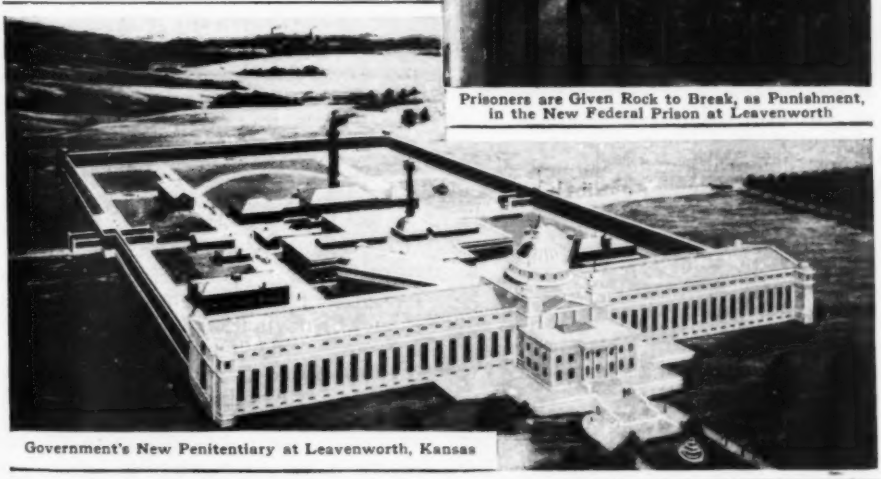
The proposed new $3,500,000 penitentiary at Joliet, Ill., will be located on the west bank of the Des Plaines River about one mile from the site of the present institution. Eight circular cell houses with glass roofs, instead of the regular "inside cell" type, are to be constructed in addition to the other necessary buildings. These houses will be 120 ft. in diameter with four tiers of 60 cells, thus providing room for 240



Plan of New State Penitentiary at Joliet, Ill. The Circular Cell Houses Mark a Distinct Departure from Present Methods of Prison Construction: 1—Dining Room; 2—Cell Houses; 3—Power House; 4—Shops; 5—Chapel; 6—Administration Building; 7—Wardens' Houses; 8—Hospital; 9—School; 10—Bath House

prisoners in each house, or a total capacity for about 2,000 inmates. Each cell house will be built around a conning tower so that a full view of the cells can be had from a central point, and all of the houses will be grouped around a large dining hall which will be located in the center of the 60 acres selected for the penitentiary proper. It is proposed to use prison labor only in building the new prison, which will probably be completed by 1915.

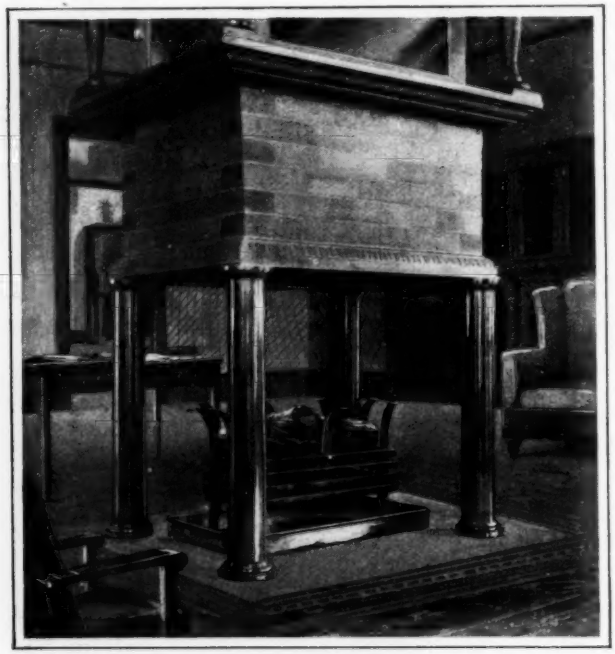
Prisoners are Given Rock to Break, as Punishment, in the New Federal Prison at Leavenworth



Government's New Penitentiary at Leavenworth, Kansas

A FIREPLACE OPEN ON ALL FOUR SIDES

On top of the rise overlooking the ocean and San Pedro, Cal., is a unique bungalow having a fireplace that is open on all sides. This fireplace is so unusual that the city of Los Angeles refused a building permit because of it, yet the inventor insists that it is perfectly safe. The chimney, which comes down at the focal point of the arches of the den and the living and dining rooms, is supported by four nickeled-steel columns. Under the center of the chimney is placed a steel grate. Screens are in place on two sides of the fireplace. Chairs for the family and guests may be placed on all four sides when desired.



A Fireplace Whose Fire Sends Out Heat and Ruddy Glow on all Four Sides

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¶The French Aero Club has pronounced itself in favor of a special test and license for hydro-aeroplane pilots.

THE PNEUMATIC TIRE OF THE FUTURE

Small pneumatic tires of twin construction will be the automobile tire of the future, according to one who has given the subject close attention and experimented with tires of various kinds. At present the twin type is used only for large vehicles because tires of twin construction have a much longer life than the other type. Although it has been said that wide twin tires retard speed, it has been found practicable to use them on motor vehicles of every description having a propelling power as low as 12 hp. This change from single to twin tires will necessitate the use of two sizes for one car, one size for the front wheels, and another for the rear wheels. It is claimed, however, that the slight inconvenience caused by using unequal sizes on the same vehicle will be more than outweighed by the money saving involved and the additional security of tread obtained when the wheels are provided with pneumatic tires of twin construction.

NAVIGATING APPARATUS ON A ROOF

The Royal Technical College in Glasgow has a splendidly equipped school of navigation where future officers of the merchant marine may learn their profession. On the roof of the school is a revolving platform on which is mounted a ship's steering wheel, a compass, and other implements designed for experimental work in adjusting a ship's compass so as to make

Students of Navigation Adjusting a Ship's Compass on the Roof of a School of Navigation in Glasgow

it independent of the various magnetic forces set up in the steel hull of a ship by the earth's magnetism. The students of navigation stand on the platform and are carried around with it as it revolves, thus making the imitation of "swinging ship" as nearly perfect as is possible on shore.

GOVERNMENT COUNTS PAPER MONEY BY MACHINE

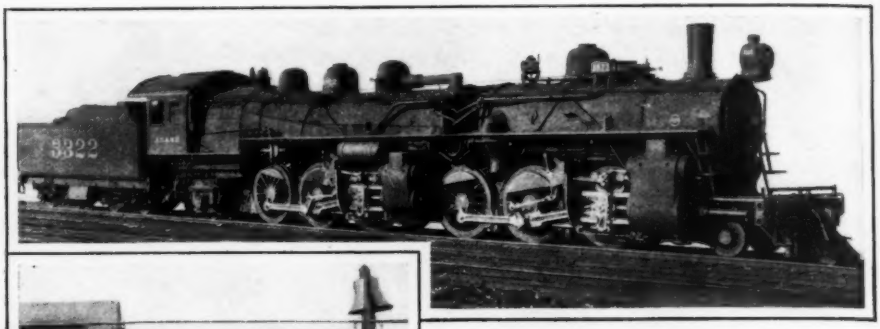
For more than a century United States paper money has been counted by hand in the Treasury Department. A counting machine now in operation has proved so satisfactory that 12 more are being built.

Bills are "fed" between revolving rolls and disks, breaking an electric circuit, which releases two flap-doors opening into a rack into which the bills drop. The counting device is attached to the doors. No count can be made if a bill is not in the machine.

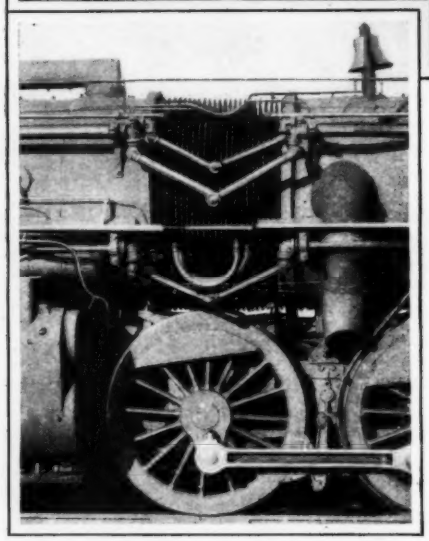
When 99 bills have fallen into the rack, the doors fly up again to receive the hundredth bill, but a mechanical trip prevents their dropping. This is a signal to the operator to put a marker on top of the hundredth bill. The pile of bills is then "banded" and is ready for circulation.

Bills of three denominations may be counted at one time, the machine having a speed of 35,000 bills a day, as against 15,000 a day, considered the limit of capacity of the most expert hand counters.

This Machine Counts Paper Money for the Government



Latest Type of Mallet Articulated Locomotive Showing "Accordion" Joint in Boiler to Permit Rounding of Curves



Near View of the "Accordion" Joint on the Newest Mallet Articulated Locomotive

LOCOMOTIVE BOILER WITH AN "ACCORDION" JOINT

The boiler of the powerful locomotive here shown is provided with an "accordion" joint for permitting the boiler to bend when passing curves, otherwise the front or rear wheels would be forced off the rails or would cause them to spread, making an accident inevitable. In this type of locomotive there are four cylinders, each pair of which operates a set of driving wheels in individual frames. The two frames are connected together by a hinge, and the two ends of the boiler by the flexible or "accordion" joint. This arrangement enables an engine with as many as 10 pairs of driving wheels to pass curves with no greater degree of friction or resistance than attends the use of the regular type of locomotive.

CHINESE TAKE TO ELECTRIC ADVERTISING DISPLAYS

Chinese merchants in Shanghai have taken up electric advertising to a surprising extent, and particularly is this so in Nanking Road, Shanghai's principal native business street. How electrical display advertising was started in this section is a rather interesting story. The municipal authorities are forcing property owners to move back when rebuilding, so as to allow more sidewalk space. The proprietors of the first store thus compelled to move back feared that the competitors who had not rebuilt and were therefore not compelled to move back would have an advantage, so erected a steel staging completely covering the front of the store and arranged an extensive electrical display. This was no sooner in operation than another moved-back store erected a similar display, and competition in electric signs has been growing ever since.

The U. S. Consul General in Shanghai also reports that the Chinese cotton mills are beginning to use electricity for power.

Electric saws are being used by at least one packing company to cut up meat for retailers.

HYDROPLANE THAT IS BUILT OF STEEL

A hydroplane built entirely of steel, instead of wood, has been completed by a resident of Boom, Belgium, and is said to have attained a speed of about 45 miles an hour. The boat is only about 16 ft. in length and weighs 360 lb. The motor is of the four-cylinder type, weighs 400 lb., and is rated at 24 hp. It is claimed that the rudder, which is placed a fraction over 3 ft. from the bow, instead of in the usual location, enables the boat to turn at high speed in a narrow channel, making a complete circle 40 times an hour in a river 60 ft. wide, and 70 times an hour when the width is 300 ft. The inventor also claims that his boat amply demonstrates that hydroplane hulls built of steel may be made to satisfy the most rigid requirements.

BUGS ROASTED AND EATEN LIKE CHESTNUTS

An insect much resembling the June bug, and found in great quantities in the high plains about Quito, the capital of Ecuador, is toasted and eaten as a delicacy by the natives of that country. They are sold in the streets in the same manner as are chestnuts in the cities of this country. The roasted bugs taste very much like toasted bread, with no pronounced flavor.

MOTOR SUGAR-CANE HARVESTER

This motor-driven machine for harvesting sugar cane is one of several constructed in an endeavor to win a $2,000 prize once offered by the Louisiana Sugar Planters' Association. The machine is propelled and operated by a 60-hp. engine. It has an arrangement of rollers and knives which grasp, cut and top the sugar cane, delivering it stripped and ready for the sugar mill. Only one man is required to operate it.

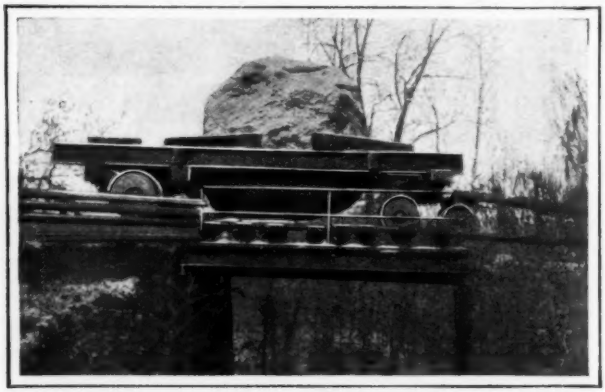
Harvesting Sugar Cane with a Motor-Driven Machine

AUTOMOBILE LAUNDRY FOR DETROIT

An automobile-laundry company has been organized in Detroit for the purpose of washing and polishing automobiles, and the cleaning of their engines by compressed air. The arrangement of the laundry provides for the entrance at one door of a soiled car, which, after having made a complete circuit of the cleaning establishment, will make its exit through another door in a thoroughly renovated condition. The entire process requires from 15 to 20 minutes and different crews of men are employed for day and night service.

GREAT BOULDER MOVED WITH DIFFICULTY

This immense boulder, which marks the site of Fort St. Joseph, at Niles, Mich., was recently moved to its present location from the woods, a distance of three and one-half miles, over roads too soft to use a traction engine, by laying more than 1,000 ft. of corduroy road and using a capstan the entire distance. The stone is about 11 ft. long, 10 ft. wide, 12 ft. high, and weighs approximately 50 tons.



Heavy Boulder Pushed over 3½-Mile Mud Road by Hand

ALUMINUM FACE HIDES BATTLE SCARS

A French soldier who took active part in the Franco-Prussian war in 1871 has been furnished with an ingenious mask which effectively conceals the scar left when part of his face was blown away by a shell during battle. In place of the man's nose and cheek bones were unsightly hollows, and a sculptor made for him an aluminum mask, which is held in position by an invisible piece of mechanism. The mask, which extends from just above the eyebrows to the lower part of the cheeks, was painted by a special process to give it a natural appearance and molded so as to show wrinkles as in real life.

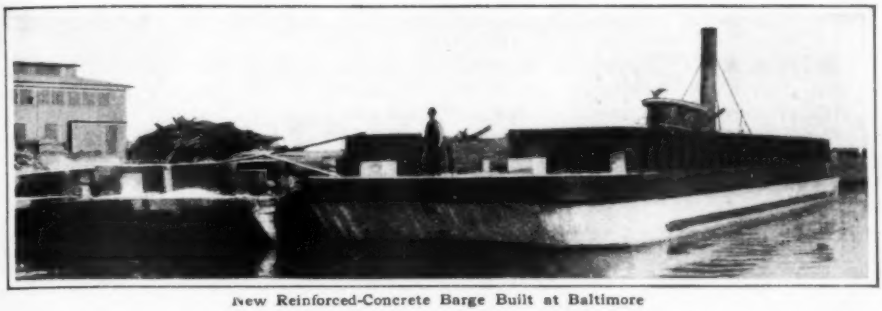
A STEAM-ENGINED MOTORCYCLE

A steam-driven motorcycle has been evolved, after two years of experimenting, by an English manufacturer of steam automobiles. The unique machine has successfully passed through its trials, and a number of them are to be placed on the market. The engine is mounted back of the rear fork, underneath and slightly in front of the saddle, and the reservoir fills the space within the diamond frame. The water is flashed into steam the moment it reaches the generator, the steam passing to the cylinder through a pipe and being ejected through two tubes on either side of the generator casing. A handlebar grip controls the water supply, and another handlebar lever controls the steam release.

The starting of the motorcycle seems to be the only drawback. An auxiliary alcohol lamp has to be brought into use before the main burner can be ignited, about 10 minutes being required before a start can be made. The machine is capable of 40 miles an hour, and is said to be exceptionally economical in fuel consumption.

PERUVIAN AIRMAN FLIES OVER THE ALPS

The first successful flight over the Swiss Alps was made the latter part of January by Jean Bielovucic, a Peruvian airman, in less than half an hour. The ascent was made from Brigue, Switzerland, on the stroke of noon and the airman landed at Domodossola, Italy, at exactly 12:25. The first man to fly across the Alps was the Peruvian Chavez, who fell just before landing and died a short time later.



New Reinforced-Concrete Barge Built at Baltimore

BARGE BUILT OF CONCRETE AT BALTIMORE

A reinforced-concrete barge, which has just been completed at Baltimore, is 112 ft. long, 29 ft. wide, and 10 ft. deep. The side walls are 4 in. thick; the ends and bottom are 6 in., and the floor or deck is 3 in. thick. The deck is supported not only by the several 6-in. walls that form the bulkheads for the 20 compartments, but also by 20 pillars, each 6 in. square. One of these pillars is placed in the center of each compartment.

The barge has a carrying capacity of 500 tons and will be used for transporting sand and gravel.

NORWAY'S CROWN PRINCE HAS TINY AUTOMOBILE

Prince Olaf, the little heir to the throne of Norway, has been given a "baby" automobile by his grandmother, Queen Alexandra. The miniature car, which is here shown in comparison with a man of average height, is an exact reproduction of a well-known American make, save that it is driven by electricity instead of by a gasoline engine. The weight of the car complete is 300 lb., and the highest speed that can be attained is 7 miles an hour.

Prince Olaf learned to run the car the morning after it was given to him, and has become an enthusiastic motorist.

The Miniature Automobile Operated by Prince Olaf of Norway

STEEL KITCHEN CABINETS

A kitchen cabinet made entirely of cold-rolled steel, with electrically welded joints, finished in and out with snow-white porcelain enamel, is one of the innovations of the year in kitchen furniture. It can be washed with soap and water without detriment. The cabinet contains a sliding table top, metal-sifter flour bin, removable sliding shelves made of wire, tea, coffee and spice jars, swing glass sugar bin, racks for pans, towel racks, and the like.

JAPANESE FIREMEN CLING TO ANCIENT CUSTOMS

The empire of Japan, as is well known, has made wonderful progress in almost every department of human endeavor during recent years, and this rapid development also applies to the Japanese fire departments in the larger cities, especially in Tokyo. The fire-fighting apparatus used in this city is of modern construction, and several features, indicative of the most advanced methods, stand out among others characteristic of remoter periods.

The fire-fighting apparatus of the Japanese, in former times, was as primitive as the prowess of the firemen was unequaled. The most useful machine then employed was a crude hand pump, which threw a stream so small that it could scarcely dampen a heated wall. Long poles with hooks to pull, and others with pikes for shoving, were also used to raze the flimsy little wooden houses, so as to form a firebreak and thus check the spread of the flames. The firemen were divided into brigades, one for each section of the city, and the members wore tight-fitting cotton trousers and coats of the same material. They also had gloves and socks of thick canvas. Each brigade was composed of the pikemen, the hookmen, and the standard bearer, who carried the "matoi" or standard of the brigade in the front of the battle with the flames. This device was supposed to frighten the "fire demon."

With the introduction of modern methods of fire fighting, the majority of the old customs have been abandoned. The pikes, hooks and the "matoi" are still used, however, and in the eyes of a foreigner the latter continues to play one of the most prominent parts in Japanese fire fighting, as every fireman is prepared to follow it to death, if need be.

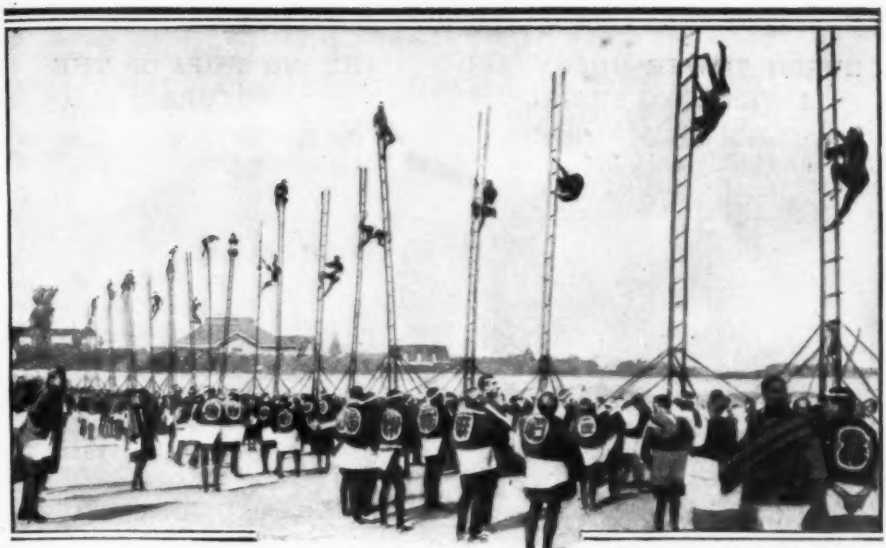
Formerly the men worked without receiving any compensation for their services, which were rendered chiefly for the glory accorded to members of the fire-fighting brigades. Wages are now paid the firemen, but only from $1.25 to $2.50 a month, so the chief attraction of the brigade members is still the honor.

When the Tokyo firemen are not on brigade duty they willingly undertake any work offered to them, such as assisting carpenters to build houses, doing odd jobs about the houses, or carrying messages for the citizens. The firemen are also employed to decorate the streets during religious festivals and to carry the banners and bouquets at funerals. On bargain days in some of the department stores extra assistance is frequently required to care for the shoes and umbrellas of the visitors, and the fire laddies are always afforded an opportunity to do this extra service. Many members of the fire brigade also find additional employment as night watchmen, who patrol the streets clapping two pieces of wood sharply together to inform the sleeping citizens that no robbers are in sight.

Once every year a great review of the fire brigades is held near the central police station. During this gala occasion the firemen entertain the multitude with acrobatic performances and other physical feats necessary to an efficient fire fighter. At the end of the performance each brigade is presented with $2.50, one hundred cuttlefish and a keg of wine, for a banquet during the evening.

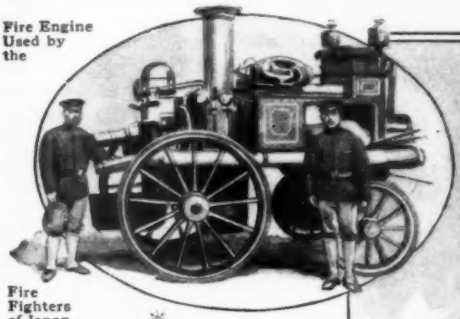
The city of Tokyo has a total of six fire-brigade stations, 40 branch offices, and altogether there are 1,703 professional firemen in the metropolitan district.

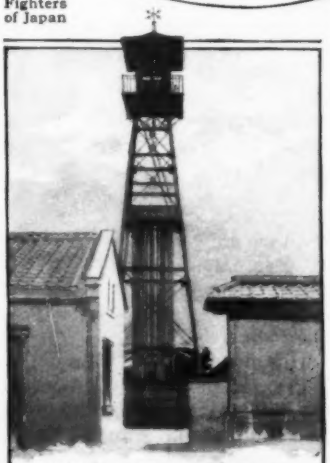
¶Steady, although not particularly rapid, improvement of country roads is shown by the following figures: In 1909 about 8½ per cent of the roads in the United States were improved, while at the close of 1912 the percentage of improved roads reached close to 10. In the five years preceding March, 1912, the Federal Government built 215 object-lesson roads, amounting, in all, to about 300 miles.



The Ladder Drill is Used by the Japanese Firemen

Fire Engine Used by the Fire Fighters of Japan





A Japanese Firemen's Watch-Tower in Tokyo

The Matoi, or Zeal-Inspiring Standard of the Japanese Fire Brigades

CHURCH TOWER UNCOVERED AFTER LONG BURIAL

The tower of the parish church in the long-buried village of Eccles, on the Norfolk coast, England, which has been practically submerged with sand for the past 32 years, was uncovered by a violent gale that recently swept this section of the English coast. The tower marks the site of the village that, in 1605, was destroyed by a mighty sea.

Photo by Topical

An Ancient Church Tower in England Recently Uncovered

MOTOR-CAR LINE TO THE KLONDIKE

It is probable that an automobile line from White Horse to Dawson, in the Yukon Territory, will be established soon, as the road has been greatly improved by the government during the last summer. The passageway was made wider and the grades reduced to such an extent that automobiles can climb them with heavy loads. As it has been thoroughly demonstrated that motor cars can be operated in a temperature as low as 70 deg. below zero, it is expected that this type of vehicle will be of material assistance in rapidly developing the northern country.

THE BIG SHIPS OF THE FUTURE

At the first International Congress of Maritime Navigation, held in Philadelphia, it was predicted that in 1950 the 20 largest boats on the Atlantic will have an average length of 1,100 ft., with a beam of more than 100 ft., and a draft of nearly 40 ft. A forecast, however, made some years ago for 1923, materialized last year, and it may well be that this forecast for 1950 will find itself an actuality 15 or 20 years sooner than the time prophesied.

Work being done to better docking facilities all over the world gives a slight indication of what may be expected. The plans for the new locks of Tilbury Dock, London, provide for ships of a length of 1,250 ft., a width of 130 ft., and a draft of 39 ft. The Suez Canal is to be deepened to 39 ft. by 1915.

INSULATING SHOES FOR ELECTRICAL WORKERS

With the ordinary flat-soled rubber shoe worn by electrical workers it is difficult to tell how far safety has been affected by wear, especially as the wear takes place inside the shoe as well as outside. Consequently, one concern is turning out a rubber shoe of the ordinary type with crossed rubber ribs vulcanized upon the sole, the heel and the instep. An adjustable ankle strap enables the shoe to be worn on various sizes of foot over the ordinary walking shoe.

THE CLEANING OF PASSENGER CARS

Blowing Dust Out of Seats Removed from a Car

Cleaning Backs of Seats with "Blower"

Steel Cars Scrubbed with Special Soap and Chemicals

The Ordinary Cleaning of Steel Cars

Spring cleaning comes only once a year, but house cleaning on a railroad, which is akin to the annual spring cleaning, in thoroughness at least, is a continuous performance. It is done in a manner that would delight the tidiest housewife, and on a scale so enormous that it would make her throw up her hands in amazement. In the Pennsylvania's yard at Sunnyside, Long Island, for instance, over 11,000 vestibuled cars are cleaned every month or more than 350 a day; and the same thing is being done in all the great railway yards of the country. The traveler, boarding a train which is shining and spotless inside and out, does not stop to think that a few hours before the same cars were returning dusty and travel-stained from a run, with seats and carpets bearing traces left by other travelers.

GASOMETER BUILT OF REINFORCED CONCRETE

Although gas tanks made of concrete are not an entirely new method of construction, the use of this material for the moving parts of a gasometer is rare. One of the features of the pressure tank here shown is the lights mounted upon the tops of the upright girders as a means of illumination, and also for the purpose of lending decoration to an otherwise ordinary example of reinforced concrete construction. This gasholder or gasometer was built at San Sebastian, Spain.

Gasometer at San Sebastian, Spain

¶ The descendants of Paul Revere have donated funds for repairing the spire of the Old North Church in Boston, upon which the two signal lanterns were hung that caused him to take his famous "midnight ride" in 1775.

"SUBMARINE FIDDLING" FOR UNITED STATES NAVY

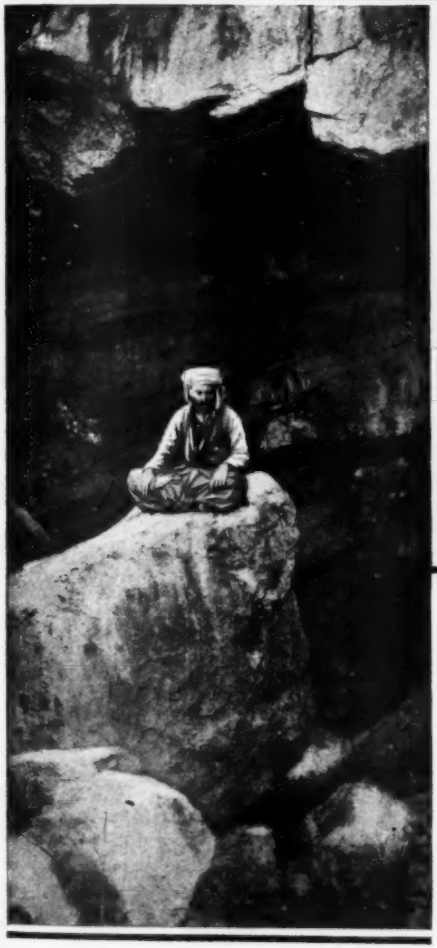
"Submarine fiddling" is the latest device adopted by the United States navy to make more effective its means of communication during time of war. The phrase tersely describes the plan employed for signaling from submarine torpedo boats when operating either on or under the surface.

On one side of the vessel are two steel projections, to each end of which is fastened a tightly stretched wire that rests against the roughened rim of a wheel. When the wheel revolves the wire is set in vibration as a violin string is agitated when a bow is drawn across it. The wheel, which plays the part of a bow, is connected by a shaft with an electric motor and the motor is controlled by a Morse telegraph key. When the key is pressed the wheel instantly begins to revolve and the wire is caused to vibrate. Any operator may use the key precisely as he would an ordinary telegraph key, and vibrations are set up in the wire corresponding to the dots and dashes of the Morse system. The receiver may be placed under water off shore and connected by ordinary telephone wires with a fort or station on land.

The invention was carefully tested on a submarine torpedo boat at Hampton Roads and it was found that the vibration of the wire could be detected at a distance of five miles, an ordinary telephone receiver being employed to catch the message which was transmitted from a station on shore.

WORLD'S CONSUMPTION OF ARTIFICIAL GAS

It is estimated that the gas produced for illumination, cooking and heating in the cities and towns of the world reached a total in 1912 of approximately 620,000,000,000 cu. ft., in the manufacture of which about 60,000,000 tons of coal were consumed. From this coal was also produced about 30,000,000 tons of coke and 3,000,000 tons of tar. London still leads in gas consumption, per capita, with Amsterdam, Berlin, New York and Paris following.

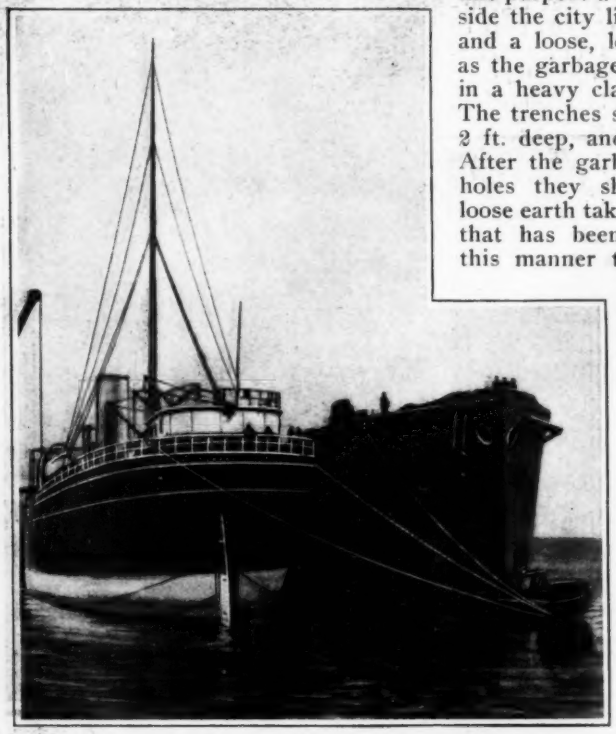


HOMES OF TWO FAMOUS FOREIGN HERMITS

Nearly every locality, even in this country, has its hermit or a tradition of one, but very few hermits have homes as unusual as the ones here shown. The hermit of Banias, a small village near Damascus, lives in a grotto, and is most often seen squatting on a large rock within it. Campanario, Madeira Island, has a hermit who lives in the hollow base of a giant chestnut tree.

UNUSUAL PICTURE OF MARINE SURGERY

Marine surgery, even to the extent of cutting off half of a big ship and replacing it with new construction, is not uncommon, but it is unusual, to say the least, to see the two halves of a ship moored side by side and facing in the same direction. The vessel is the "Milwaukee," of Liverpool, whose forward portion met with a disaster which necessitated the surgical operation. The photograph was taken just after the new forward half was launched. The two sections were then floated into drydock for the "wedding ceremony."



Stern and Bow of the Same Vessel Photographed Side by Side

¶The United States has 20,567,000 horses valued at $2,278,222,000, and approximately 4,386,000 mules.

BURIAL OF GARBAGE FROM SMALL CITIES

The disposal of garbage in small cities and villages by burying it in the ground is considered the most sanitary method possible where economy must be considered, according to an engineer of the Ohio State Board of Health. For this purpose a section of level land outside the city limits should be secured, and a loose, loamy soil is preferable, as the garbage does not readily decay in a heavy clay or coarse sandy soil. The trenches should be dug from 1 to 2 ft. deep, and about 6 or 7 ft. long. After the garbage is thrown into the holes they should be covered with loose earth taken from a near-by trench that has been newly excavated. In this manner the entire field may be used and, after a certain time, according to the character of the soil, has elapsed, the land can be used again for the same purpose.

Experiments conducted by another sanitary engineer indicated that, if the garbage is spread over the ground to a depth of about 1 ft. and covered with a 12-in. layer of earth, the greater part of the refuse will have disappeared in from six to nine months without giving forth any objectionable odor, and solid parts of the waste will have decomposed entirely within three or four years.

CEMENT MOUNTAINS AND PORCELAIN TOWNS

The mountains of this giant relief map of Salzburg, Austria, and its district, were made of cement and various natural stones, while porcelain was used to make the towns and cities. The natural representation of meadows, forests, lakes and rivers was

Courtesy The Sketch, London

Great Relief Map of Salzburg, Austria, and Its District, Made from Cement, Stones and Porcelain

obtained by the use of paint. The work was begun by Herr Pornbacher, a sculptor, in 1905, and has just been completed at a cost of more than $10,000.

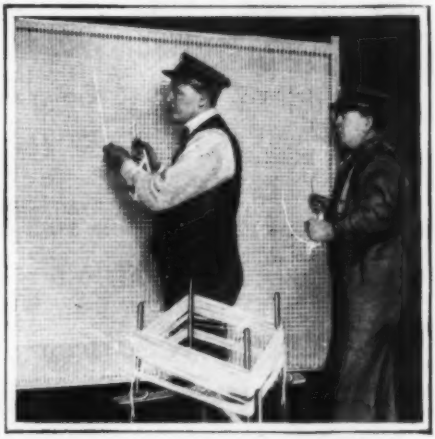
IMPROVED METHOD OF TREATING FLAX FIBER

A new method of preparing flax fiber of much finer grade than can be produced in the ordinary manner has been discovered by a Russian engineer. The process consists in treating the flax with alcohol, and then mineral oil and steam, with the result that linen and cotton can be made for less than one-fourth the cost of producing a similar grade of cloth by the old method. The new process also has the advantage of reducing the amount of waste and permits the use of both long and short fibers.

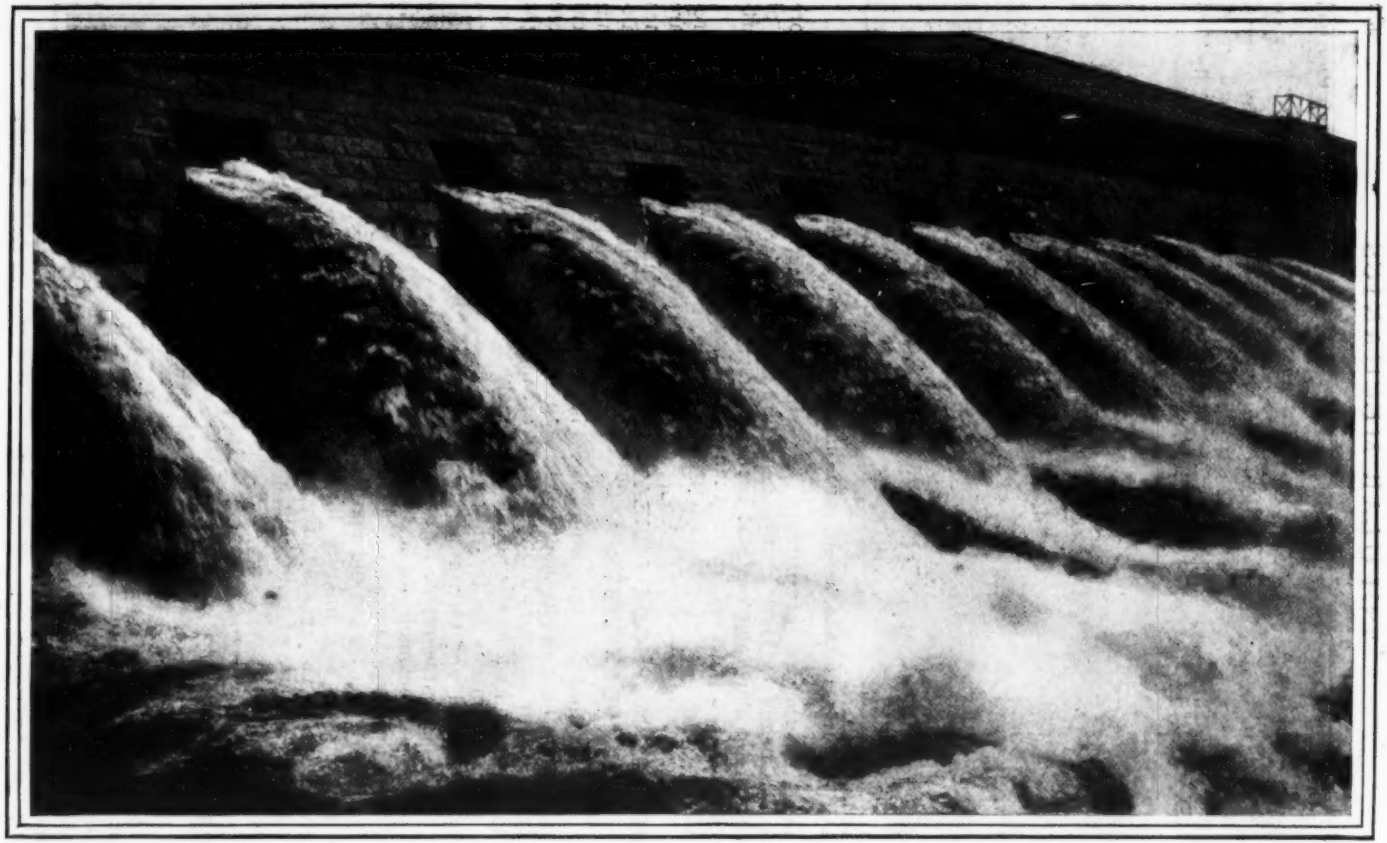
FIREMEN WEAVE SHAWLS IN LEISURE TIME

Members of the Syracuse fire department have found a unique way of converting leisure time into profit. They make fine Shetland shawls, weaving them on a large wooden frame. The first shawl completed was as soft as silk, and perfectly made. Three more are now under way. The idea has, of course, the approval of the fire-department heads.

There is much monotony in a fireman's existence, and hours of time are spent in playing cards and such games as checkers. The possibility of breaking this monotony by doing work that is profitable is one that should appeal to firemen all over the country. There are many kinds of things firemen might make during spare time.



Syracuse Firemen Making Shetland Shawl during Leisure Moments



Courtesy The Sphere, London

A Striking View of the Assouan Dam on the River Nile Showing Open Sluices of One of the Greatest Feats of Modern Engineering

RIVER WATER USED EIGHT TIMES IN CALIFORNIA

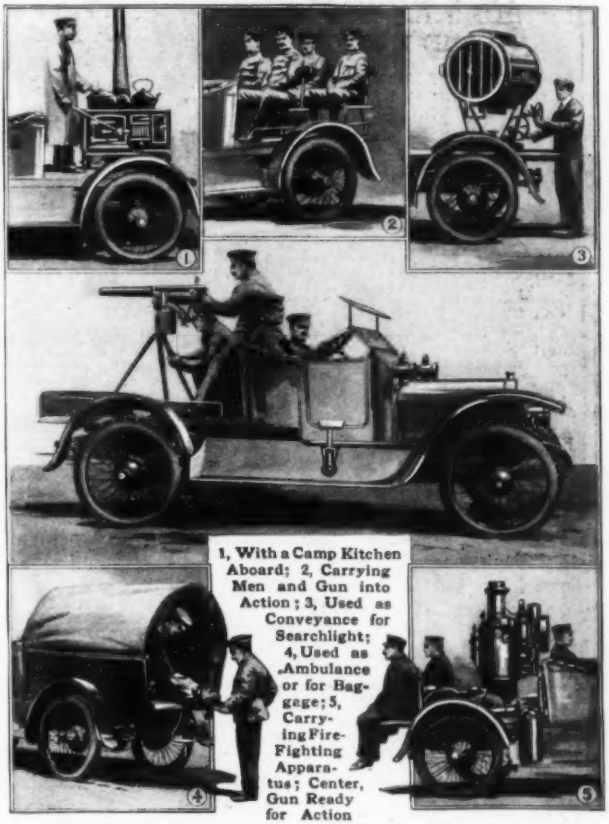
A part of the water of the Santa Ana River in southern California is used eight times, as follows: From a reservoir in the San Bernardino Mountains it is diverted through two electric power plants and then used for irrigation purposes about Redlands and Highlands. The water not absorbed by the ground is recovered through springs and used for irrigating the land about San Bernardino. Some of it reappears in the river above Riverside Narrows and is utilized for power purposes. It is then returned to the river above Corona and distributed by canals to the orange groves around Santa Ana. Some of the water is once more recovered by the pumping plants west of this city and used for the eighth time.

SIGHT-SEEING CANAL TRAIN

It is now possible for visitors to see the entire Panama Canal by means of a special sight-seeing train put into commission for this purpose. The daily schedule of the train provides for a trip over the Pacific division during the morning and through the great Culebra cut in the afternoon of Monday, Wednesday and Friday. The trip to Gatun dam is made on Tuesday, Thursday and Saturday. Two consecutive week days are required for seeing the entire work, which is further explained by lectures delivered at the tourist station in Ancon and illustrated by the use of models.

MOTOR CAR FOR BOTH PEACE AND WAR

One of the most adaptable motor cars that has ever been constructed is here shown. The vehicle, which is fitted with a 15-hp. engine and an extra-strong chassis, has a two-seated touring body so arranged that the rear portion may be quickly detached. This part may then be replaced by one of various other bodies which are mounted on folding legs and casters, so that the interchanging process can be effected without difficulty by one individual. Thus, the vehicle can be quickly converted into a practical fire-fighting apparatus; an ambulance; a baggage wagon; a camp kitchen; a

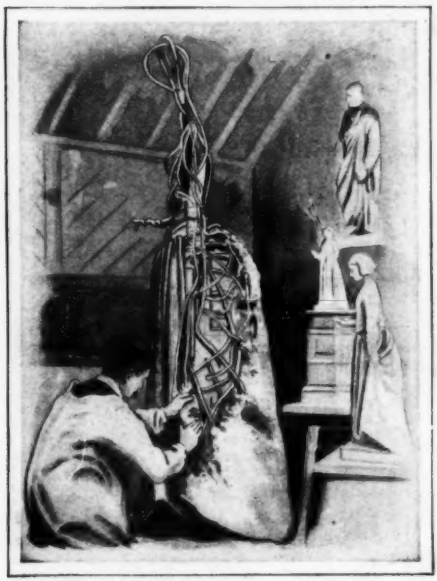


1, With a Camp Kitchen Aboard; 2, Carrying Men and Gun into Action; 3, Used as Conveyance for Searchlight; 4, Used as Ambulance or for Baggage; 5, Carrying Fire-Fighting Apparatus; Center, Gun Ready for Action

conveyance for carrying a field gun and soldiers into action; a gun carriage for supporting the gun when it is discharged; or the car may be used for transporting a searchlight during military operations.

THE NIGHTINGALE STATUE IN THE MAKING

The sculptor who is making the Florence Nightingale statue uses methods that differ a little from those



A Sculptor Using a Framework of Wood and Gas Pipe

of his contemporaries, according to the London Graphic. In the first place, he is almost entirely his own workman. After his small plaster statuette is finished, he constructs a framework of wood and gas pipe that reminds one of a dressmaker's frame, slightly exaggerated, and on this foundation applies the plaster superstructure himself.

¶Over eight billion pounds of sugar were consumed in the United States during 1912, and one-fourth of this amount came from our own cane in Hawaii and Porto Rico.

VALUE OF MOTORBOATS TO TUSKET LOBSTERMEN

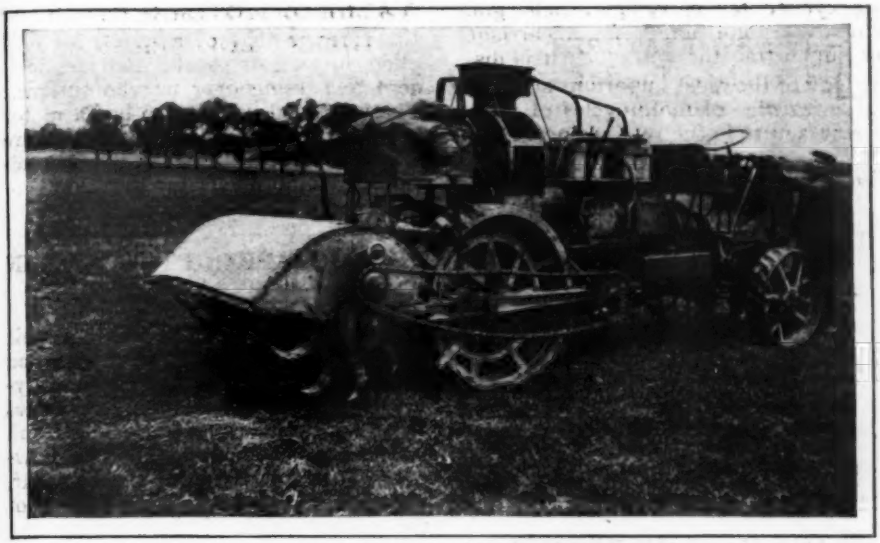
There is probably no settlement of fishermen along the Atlantic Coast more benefited by the motorboat than the lobstermen of the Tusket Islands, in the mouth of the Tusket River, Nova Scotia. During the open season for lobsters the trappers must be near the base of supplies, so hundreds of lobstermen and their families seek these little, rocky islands and live upon them in communities that are isolated from the world at large.

Until the advent of the motorboat the lobsters were obtained only by means of the sail or rowboat, which always meant a waste of time in setting traps in locations favorable for a catch. It was customary for a crew to take all day in placing the traps, some of which had to be located miles apart. Then it took another day to sail or row over the same route to haul up the 30 or 40 traps and withdraw the lobsters. Now the motorboat, usually a small but seaworthy craft, powered by a 3 or 5-hp. engine, is almost universally used, enabling the lobstermen to go over the routes twice each day.

BLOWTORCH CLEANS ICE FROM SWITCHES

A blowtorch consisting of a brass tubing, 2 in. in diameter and about 5 ft. long, with a burner at one end and a gasoline valve and pressure pump at the other, has been devised especially for thawing ice, snow or sleet from switch points, derails, frogs and other movable track connections. The tube has a capacity of 3 qt. of gasoline, which is sufficient for about three hours' operation. The flame is about 2 in. in diameter and 12 in. long.

The torch was tested recently in the Chicago yards of the Chicago Great Western Railroad. One man using the torch cleaned 160 switches in three hours, an amount of work that would have required five or six men to accomplish in the same time, using picks and brooms.

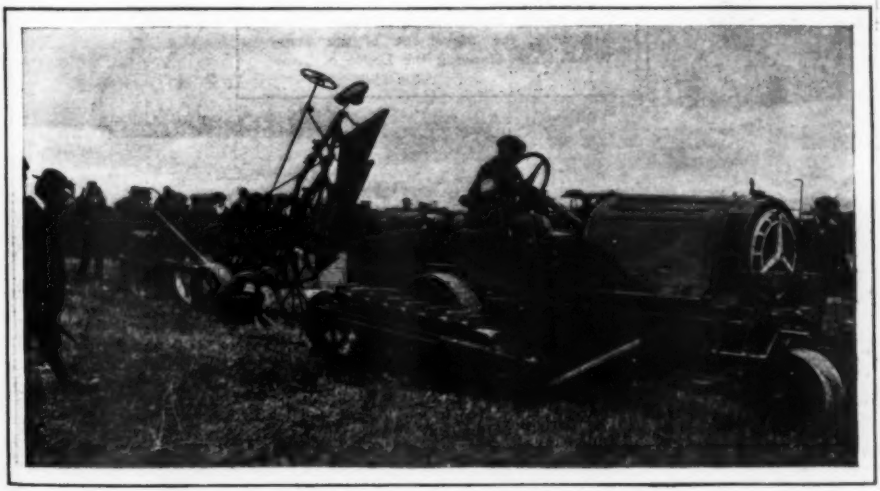


French Self-Contained Soil-Breaking Machine

NEW FRENCH FARM TRACTORS

Machines have "nationalities" as well as peoples. That is, machines evolved in different countries for similar purposes have many characteristics that differ. The two farm tractors here shown, for instance, would instinctively impress the American farmer as "foreign," even though seen on an American field.

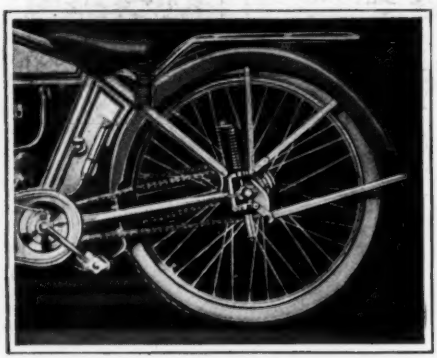
¶The amount of capital invested in the electrical business in the United States is in the neighborhood of $6,000,000,000.



A French Tractor Hitched to a Double-Ended Plow

MOTORCYCLE WITH SEVERAL NEW FEATURES

One of the most important and valuable features of motorcycles of recent manufacture is the rear spring suspen-

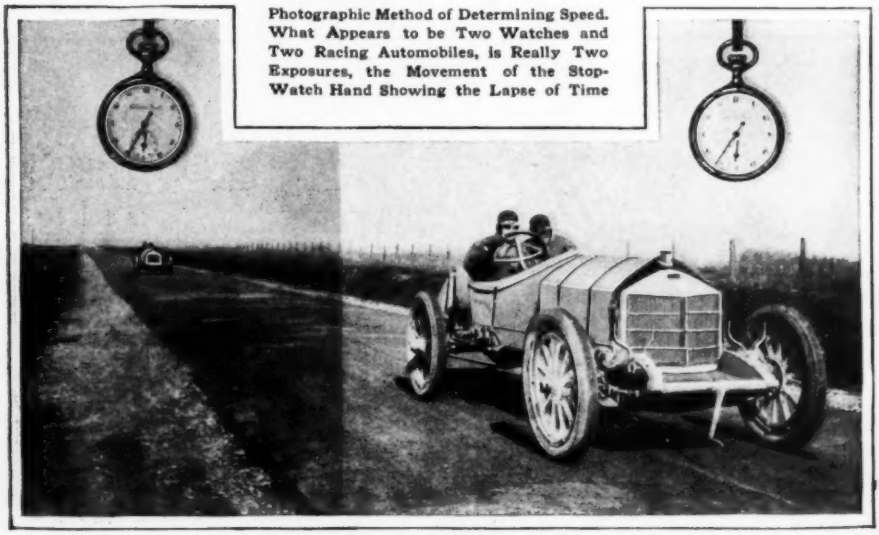


One of the Latest Types of Motorcycles

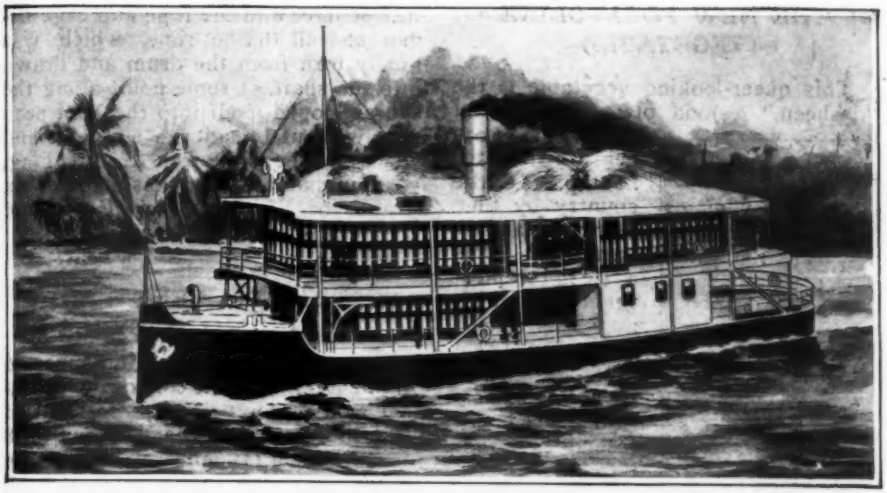
sion, a device which absorbs shock, insures greater safety and comfort, and results in a longer wheel and tire life than other forms of rear-spring suspension thus far employed on motorcycles. By its use, in combination with the spring fork shown in the illustration, the frame, motor and rider are completely suspended, and the only idea of motion present in the mind of the rider is that of a quiet, forward glide, instead of shocks and jars incident to passing over uneven surfaces. The improved model also has a motor built with overhead valves, a feature which represents another distinct advance in motorcycle construction.

PHOTOGRAPHING THE TIME IN AUTO SPEED TESTS

An example of a photographic method of determining the speed of an automobile is shown in the accompanying illustration. The photograph shows what appears to be two watches and two racing automobiles. It is, however, the same watch and the same car, photographed twice, and the method of the taking, and of determining the speed, are as follows: A stop watch is suspended on a bracket in front of a stereo-camera having two lenses and shutters arranged for independent operation. When the racing car rushes down the speedway toward the camera, the double picture is taken by snapping first one shutter and then the other, a distinct time interval being allowed. The stop watch indicates the time that



Photographic Method of Determining Speed. What Appears to be Two Watches and Two Racing Automobiles, is Really Two Exposures, the Movement of the Stop-Watch Hand Showing the Lapse of Time



The Cabins of This River Steamer are Kept Cool by Fountains That Play on the Roof Awning

elapses between the exposures, and the distance traveled by the automobile is ascertained by considering the focal length of the camera, an exact measurement being made on each negative, compared with a previously prepared scale.

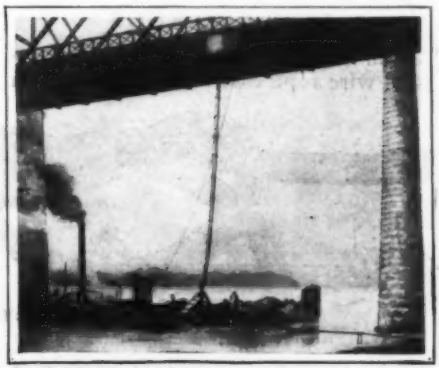
The illustration shows Ralph Mulford driving a racer on the Long Island motor parkway. The distance covered between exposures was 151 ft., and the hand of the stop watch is shown to have advanced just one second, which gives a speed of 102.95 miles per hour.

STEAMBOAT PROVIDED WITH "ARTIFICIAL RAIN"

The shallow-draft passenger steamers built by an English shipbuilding concern for river service in the tropics are equipped with "artificial rain." Up through the awning forming the roof of the upper cabin project two water pipes, each of which is fitted with a spray head. These fountains throw sprays of water over the awning, and the rapid evaporation under the hot rays of the sun keeps the cabins cool.

BRIDGE PIERS BUILT BY SPOUTING CONCRETE

Building the piers of a new bridge by dropping the concrete down through a long pipe from the deck of the old bridge was an original method of engineering recently employed in constructing a large railroad bridge over the Ohio River, at Louisville. By using short tapered sections of pipe coupled together the many batches of concrete were successfully dropped the entire distance of 115 ft. to the pier foundations without injuring the quality of the building material.



Courtesy Railway Age Gazette

Building Bridge Piers by Dropping Concrete through Pipe

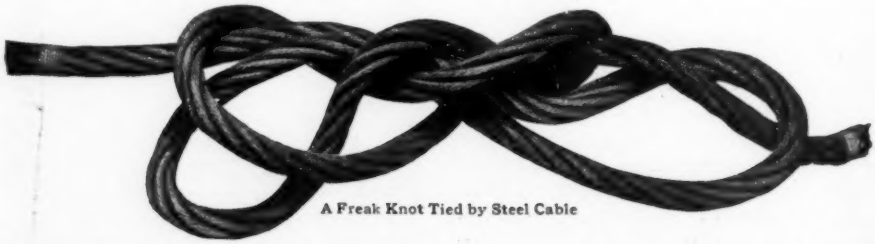
THE NEW POTATOLIKE VEGETABLE

This queer-looking vegetable is the "dasheen," a food plant the seed of which is now being distributed in all parts of the country by the Agricultural Department. It is a semitropical vegetable which may be prepared and eaten like potatoes, and, with its hairy skin peeled off, resembles a potato in appearance. The taste of this vegetable is very "meaty" and rich.

Semitropical Potatolike Vegetable being Introduced by Agricultural Department

STEEL CABLE TIES ITSELF INTO ODD KNOT

This peculiarly shap 1 knot of cast-steel wire rope was tied by itself when the shaft engine of a coal mine met with an accident whereby the drum was set free and the rope and cage began to fall. The rope, which was finally torn from the drum and drawn into the shaft, at some point along the course looped itself into the knot seen here without breaking a single strand of wire. The cable was 1,280 ft. long, 7/8 in. in diameter, and was made of six strands of No. 19 gauge wire wound around a Manila-rope center.



A Freak Knot Tied by Steel Cable

COST HALF A CENT A MILE TO RUN MOTORCYCLE

Figures carefully kept for a period of nine months of the cost of the operation of a motorcycle by a resident of Ohio showed a total cost of only $25.48 for traveling 4,172 miles. This expense covered gasoline, oil, repairs and all other actual expenses, but not depreciation of tires or the working parts of the motor. Forty-four gallons of gasoline were used at a cost of $9.47 and 10 gal. of oil, which cost $10.26. Repairs cost $5.75. The total expense, in proportion to distance traveled, figured out about one-half cent a mile.

MANUFACTURING LIGHTING GAS FROM SEWAGE

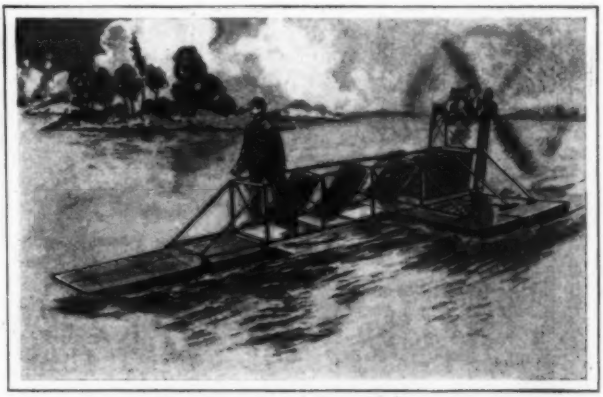
Lighting gas is being manufactured from sewage at a plant especially constructed for the purpose in Brünn, Austria. A cubic meter (about 35 cu. ft.) of sewage contains on the average 1/10 lb. of sludge, and it is from this sludge, resembling peat when dried, that the gas is obtained. About 37 tons of dry sludge are being treated daily by the plant, yielding 290,863 cu. ft. of gas and 610 lb. of ammonia.

NEW COLORED MOVING PICTURES

A well-known firm has just succeeded in applying the three-color process of color photography, invented some years ago, to moving-picture films, and the results are far superior to any seen up to the present time. The method employed in making the picture is to take three photographs at the same time through different-colored screens, and then superimpose the three films. When a strong light is cast through the combined films the various tints are seen with extreme exactitude. The pictures are a quarter the size of the usual film, so that they are quite small, and the rolls consequently shorter. At present the endeavors of the firm seem to have been concentrated on landscape and flower photography, and such a high state of perfection in reproducing colors has not been obtained in other fields. The flowers in vases, revolved before the camera, come out on the white screen with perfect stereoscopic effect.

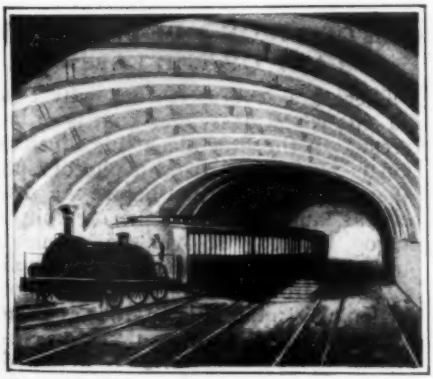
AN AERIALLY PROPELLED WATER GLIDER

The Bleriot concern in France is experimenting with an interesting type of craft called a water glider. It has three floats, one in front, and two in the rear, connected by a sort of bridge, on which there are three canvas seats of the reclining-chair type. This machine, driven by an aerial propeller, is said to attain an exceptionally high speed.



A Water-Glider Type of Motorboat Designed by Bleriot

¶ Natural butterfly wings mounted between sheets of rock crystal are a new jewelry fad.



Courtesy The Sphere, London
The Train That Opened the Service in the London Subway 50 Years Ago

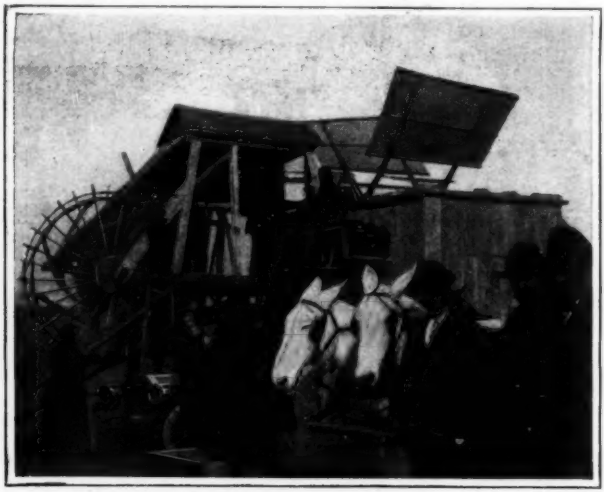
FIRST UNDERGROUND RAILROAD

London recently celebrated the 50th anniversary of the first underground railway built to facilitate passenger transportation in a city. The first section of the London "underground" was opened to the public in 1863, and the accompanying illustration shows the first train. The locomotive is a six-wheeled tank engine designed to bottle up its steam and smoke, so as to keep the air in the tunnel clear.

Steam locomotion did not give way to electricity in the London subways until 1906.

COMBINED WIND AND TREAD MILL OPERATES MINE

A curious windmill is used to hoist coal out of the mine shaft and to pump water from a mine at Cherryvale, Kan.



Unique Wind and Tread Mill Used to Hoist Coal and Pump Water from a Mine

There are four vanes, each being 7 ft. long by 4 ft. wide, mounted on a horizontal shaft extending east and west, the prevailing wind being from the south. When the wind blows from the north, a system of shifting belts reverses the driving apparatus. A wind blowing from the east or west is useless.

One of the curious features of this unique outfit is the tread wheel. When the wind is too light the load is hoisted by walking upon this wheel. The owner of the mine claims that the windmill will hoist a half ton of coal with a 10-mile wind. With a 20-mile wind, 100 loads can be hoisted in eight hours.

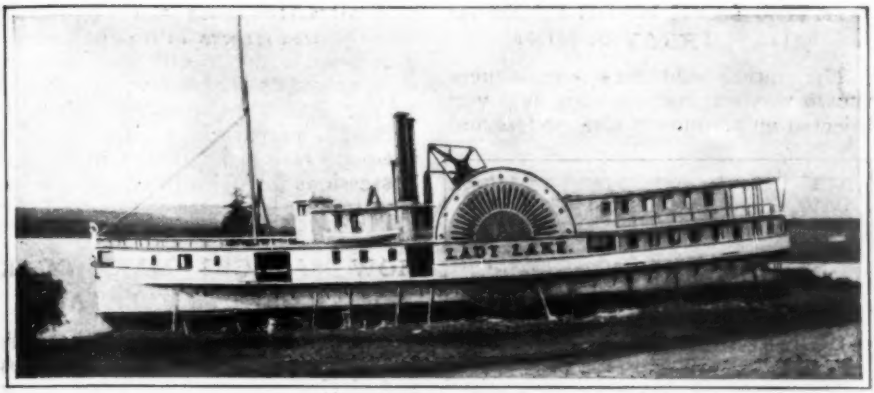
¶With a new ignition device for gasoline engines, called a "synchronizer," and designed to take the place of a magneto, it is possible to obtain either a vibrating or a nonvibrating spark, the first being used for starting and the second for steady running.

GERMANY'S NEW LAW ON FIREARM MARKS

The German government has passed a law prohibiting the passage through its custom house of any firearm that does not bear a mark showing that it has been thoroughly tested and fired by the makers. At the custom house a chart is kept on file showing the various gun-manufacturing firms whose proof marks are registered in Germany. Other firms in London, Manchester, Paris, Liege and St. Etienne are included, but no American manufacturer is represented. For this reason the manufacturers of all American guns exported to Germany should apply to the Bundesrath, Berlin, for the registration of their proof marks. The application should give a picture of the marks and indicate where they are situated on the guns, together with the caliber and other important details of the firearms. The new law is intended to protect the public from using firearms that are unsafe.

THE OLD IRON SIDE-WHEELER "LADY OF THE LAKE"

There are several reasons why this old side-wheel passenger boat is of interest. In the first place this illustration is reproduced from a photograph taken 46 years ago, just before the vessel was launched into Lake Memphremagog, located just over the Vermont border in Canada. Secondly, her hull is of solid iron, and iron hulls were not particularly numerous in 1867. Then again, she was built in sections in Scotland, shipped across the ocean in one of the Canadian transatlantic liners, and put together at the point shown in the



Iron Side-Wheeler Built Nearly a Half Century Ago in Scotland, and Shipped to Canada in Sections

illustration. Finally, she is still being used on Lake Memphremagog, and there is every reason to believe that she will run many years more.

CATHOLIC CHURCHES TO BE CONNECTED BY WIRELESS

If the different governments interested do not make too serious a protest, the principal Catholic churches of Italy, France, Austria, and perhaps several other European countries, will be connected with the Vatican and with each other by wireless. Cardinal Maffi, archbishop of Pisa, who is prominent as a scientist, has been carrying on the experiments and has already communicated successfully with the Jesuit church in Gratz, Austria, following which the Austrian military authorities ordered the immediate demolition of the station, fearing that it was intercepting army messages. Cardinal Maffi is unofficially striving to convince the authorities that his wireless system is specially attuned and that the intercepting of messages from other sources is impossible.

NEW YORK'S NEW AUTOMOBILE STREET CLEANER

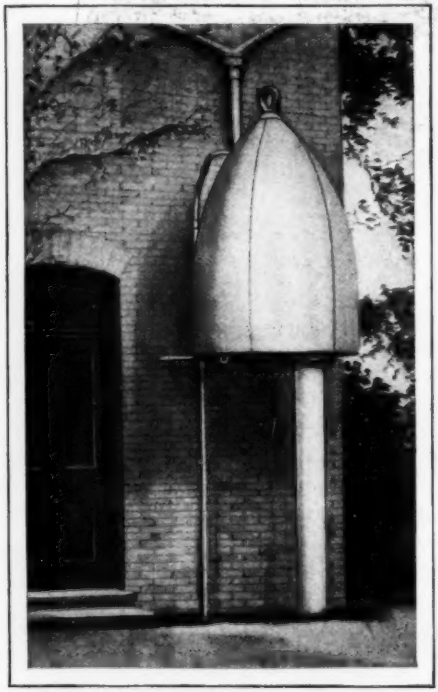
The street-cleaning department of New York City, in an effort to find a more efficient method of cleaning the streets of this great metropolis, is testing a street cleaner mounted upon a motor truck. It will be observed that the vehicle has a steel-toothed scraper, for loosening hard snow, ice and refuse, attached beneath the body.

Photo by Paul Thompson

How New York is Cleaning Her Streets

WATER TANK MADE FROM A BUOY

The rather odd water tank here shown was originally a buoy that was rejected on account of some defect and



Water Tank That Originally was a Buoy

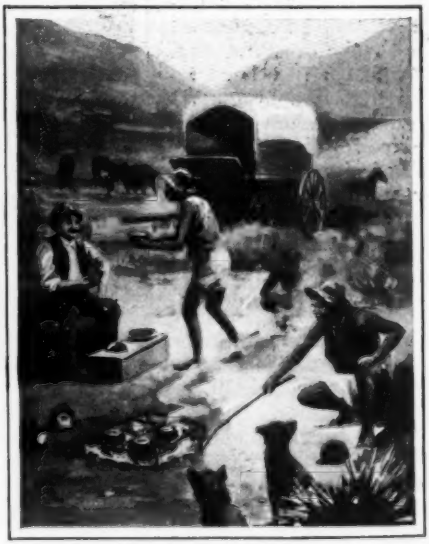
returned to the manufacturer. A householder saw the discarded piece of ironwork some time afterward and, after having bought it, had the conical-shaped vessel erected as a water tank in front of his home.

SHIPLOAD OF OATS CHANGES BALANCE OF TRADE

One shipload of oats arriving at the port of Tripoli, Africa, last December changed the balance of trade between that country and the United States in favor of America. The cargo was shipped from Newport News November 22, on the steamship "Corozal," which arrived at Tripoli December 12 and attracted much attention, as it was the first American freight steamer ever seen in that port. The cargo of oats, valued at $128,608, was consigned to the Italian government, which is making preparations to provide adequate terminal facilities in its new possessions in Africa to encourage foreign trade.

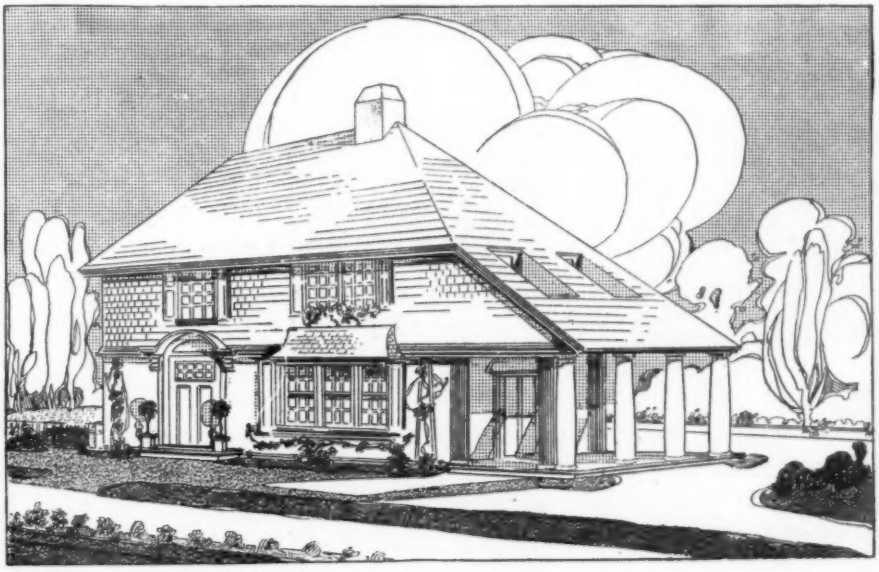
HOW SAVAGES MAKE MILK OF COCOANUTS PALATABLE

Improving the quality of the milk from cocoanuts by cutting off the tops and placing the nuts over a bed of hot ashes until the warmth causes the "butter" in the surrounding meat of the nut to be absorbed by the milk is a method used by natives along the Orange River in South Africa. According to the Illustrated London News this treatment changes the quality of the raw milk of the nut and gives it a more palatable taste. In order to prepare the milk from several nuts at one time the Hottentots convert old iron hoops into crude holders like the ones here shown.

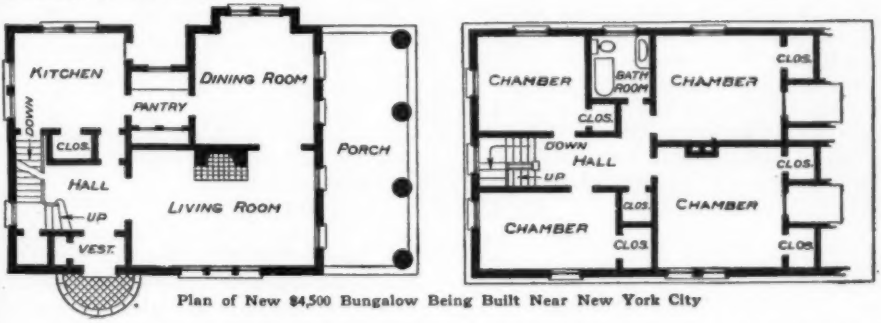


Enriching Milk from Cocoanuts by Heating Them over Hot Ashes

AN ARTISTIC BUNGALOW THAT COST ONLY $4,500



Wm. F. Leppin, Architect, Brooklyn, N. Y.



Plan of New $4,500 Bungalow Being Built Near New York City

This design for a $4,500 bungalow being built near New York City provides for the following arrangement on the first floor: living room, 13 by 20 ft.; dining room, 13 by 13 ft.; kitchen, 11 by 12 ft.; pantry, 7 by 8 ft.; a hall, closets and a porch, 12 by 30 ft. The second floor contains four bedrooms averaging about 11 by 14 ft., a bathroom, hall, and the necessary closets.

CHINA USING TYPEWRITERS IN LARGER NUMBERS

There has been a steady increase in the use of typewriters among Chinese business houses, due to the recent changes in Chinese political and commercial organizations. Exporters of typewriting machines report that foreign firms in the open ports are also increasing the use of this labor-saving device, since a number of Hongkong schools are producing a large and increasing force of capable Chinese stenographers. About 500 typewriting machines are already in use among the more conservative commercial houses in Hongkong.

PARCEL-POST SCALES SHOW AMOUNT OF POSTAGE

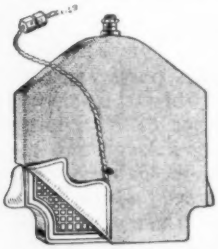
These scales, designed especially for the parcel post, indicate automatically, according to zones, the amount of postage required for the package weighed by it. When the package is placed upon the scale, the hand on the dial not only shows its weight, but also the amount of postage required for all the postal zones.

HOW RAPIDLY GASOLINE EVAPORATES

One pint of gasoline left in an uncovered basin in a room at a normal or average temperature will entirely evaporate within 24 hours. As gasoline vapor is denser than the surrounding air, unless disturbed by active air currents its presence in the room may be detected for many hours. One pint of gasoline will make 200 cu. ft. of explosive mixture and this mixture is seven times more powerful than gunpowder.

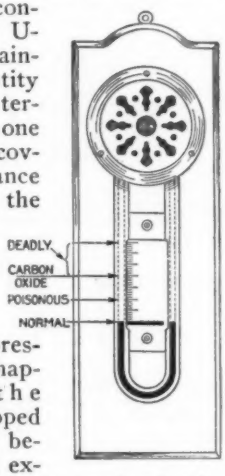
ELECTRIC BLANKET FOR AUTO RADIATORS

A simple and effective device for preventing the freezing of the radiator, and other parts of the cooling system of an automobile, while the machine is standing in a cold garage, has been put on the market in the form of an electric radiator blanket. It comprises two thicknesses of cloth between which are placed a number of fine, flexible resistance wires, connection being made by means of a flexible wire to a screw plug. When the machine is driven into the garage, all that is necessary to do is to place the blanket over the radiator, screw the plug into the nearest fixture and turn on the current.



DETECTS CARBONIC OXIDE GAS IN THE AIR

A simple and reliable device for automatically registering the presence of carbonic oxide in the air is shown in this diagram. It consists of a closed U-shaped tube containing a small quantity of colored fluid, terminating in bulbs, one of the bulbs being covered with a substance which absorbs the carbonic - oxide gas and thereby becomes more or less heated, according to the quantity of gas present. When this happens, the air in the side of the tube topped by this bulb also becomes heated and expands, forcing the fluid to rise in the other tube.



Carbonic oxide is a gas which occurs when coal is burned without a sufficient supply of air, and is often present in rooms heated by coal stoves.

AIRSHIPS OF LARGER SIZE BEING BUILT

The new airships being constructed by the German government will have a larger carrying capacity than those built heretofore. Each of them will accommodate a crew of 15 persons, several tons of explosives, two machine guns, and all of the new vessels have been designed to remain in the air for at least 60 hours without landing.

OLD CARRIAGE BODY USED FOR AUTOMOBILE

One of the "classiest" automobiles seen on the boulevards of Chicago has a body that was once part of a horse-drawn brougham of rare design and workmanship. The automobile in question is the property of Harold F. McCormick, John D. Rockefeller's son-in-law. The brougham, built by a famous carriage builder, was a favorite with Mr. McCormick, so he had the body mounted on an automobile chassis. Two men in livery, the driver and a footman, ride on the front seat, as in the days when the brougham was horse-drawn.

THREE HUNDRED THOUSAND DOLLAR ALBUM

A wealthy citizen of Budapest, Hungary, has an autograph album which contains the finest collection of modern autographs in the world. The leaves of the volume, which is about 10 in. thick, are covered with signatures and sentiments written in 44 different languages. The collector has spent more than eight years' time and over $70,000 traveling about the world to secure the contents of his remarkable book, for which he has refused the sum of $300,000.

¶The new street cars for Ottawa, the capital of Canada, have floors of double thickness, with tarred paper between. This makes the cars much warmer than does the old-style single floor, and also muffles the noise of the motors and running gear underneath.

PLAGUE GARMENTS OF THE PAST AND PRESENT

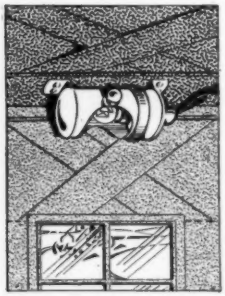
Hundreds of years before germs were discovered physicians knew from experience that certain diseases could be contracted by contact with the sufferers, or by breathing the same air. Accordingly, in times of plague, contamination was guarded against by the wearing of plague-proof garments. The garment worn about the time of the plague in Rome, 1656, was not dissimilar to that worn by the cholera workers in Manchuria in 1911, but the birdlike face-covering is unique.

The Plague-Proof Garments of 1656 and 1911

¶An "emergency squadron" of motorcyclists has been established by a motorcycle manufacturer for the purpose of repairing the vehicles of any motorists who may be stranded upon the roads adjacent to New York City.

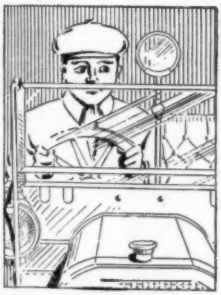
NOVELTIES AND ODDITIES, USEFUL AND ORNAMENTAL,

A lamp, designed for lighting the interior of an automobile equipped with a canopy top, has a shutter, which, when closed, protects the bulb from being broken when the top is raised or lowered. The shutter is shaped like a cylinder and the inside is silverplated, thus making an excellent reflector.

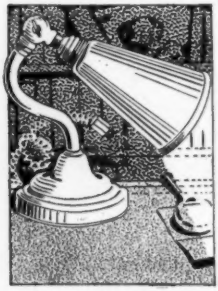


Canopy-Top Lamp for Motor Cars

An ingenious automobile headlight "glare remover" consists of a round pane of amber-colored glass so mounted upon the windshield that, by looking through the amber glass, the glare of approaching headlights is effectually removed without obstructing the view of the road and the motor car that may be approaching.

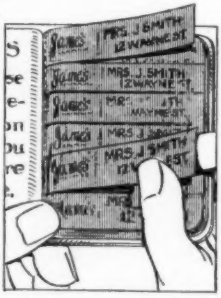


Motor-Car Headlight-Glare Remover



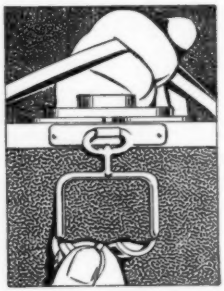
Microscope Lamp of New Design

A new lamp, especially adapted for microscopic examinations in hospitals and laboratories, is one that has a knuckle joint at the top by which the lamp can be adjusted to any desired angle. The long, conical reflector has been found most useful in concentrating the light upon the object to be examined.



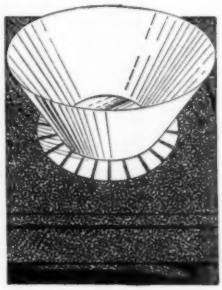
Address Book for Retail-Store Customers

One of the latest and most useful novelties on the market is a customer's address book containing 100 gummed labels with the customer's name and address printed on each label, which is covered with wax-paper protectors. The customer, when making a purchase that is to be charged, simply detaches a label and hands it to the salesperson for attaching to the sales sheet, thus making wrong delivery impossible.



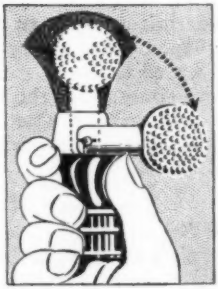
Pay-as-You-Enter Purse for Women

Makes Water Hot in Sixty Seconds



Sanitary Paper Dish for Ice Cream

A purse for holding four nickels in such a way as to be easily and quickly withdrawn when boarding pay-as-you-enter cars, even though the hands are gloved, has been placed on the market. The novelty is snapped

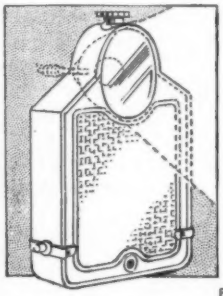


Shaving Brush and Beard Softener

securely to the ring of the hand bag, to chatelaine or chain where it is easily accessible, and is made in Roman, French-gray and oxidized finishes.

One of the illustrations shows an electrical device that makes hot water in one minute for the man who shaves and for various other occasions when hot water is required at short notice. One end of the electric cord is inserted in a lamp socket and the resistance coil at the other end is placed in the water, and the current is then turned on.

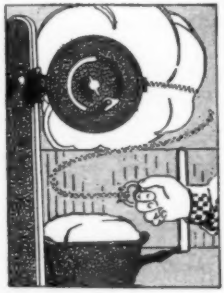
Milk-Bottle Opener and Stopper



Headlamp in Motor-Car Radiator

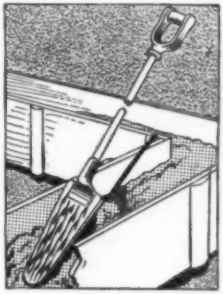
Serving ice cream and other similar delicacies in sanitary paper dishes, instead of the usual glass or metal receptacle, is being adopted by progressive caterers, druggists and refreshment dispensers. The dishes are used but once and then thrown away, thus protecting the public health and saving the additional expense incurred through breakage incident to the use of glass dishes.

Cooks Eggs Three Ways at Same Time



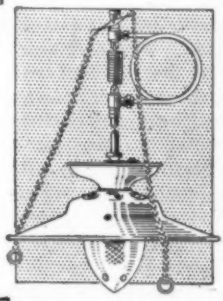
Clothes Reel for Indoor Use

A combination shaving brush and beard softener that should appeal to every man with a tough or wiry beard has made its appearance. The chief feature of the device is a small round rubber complexion brush mounted upon a strip that is attached to the handle of the brush. After the lather is applied to the face the rubber fingers will rub in the lather better than is possible by using the human fingers. The rubber can be quickly cleaned and is sanitary.

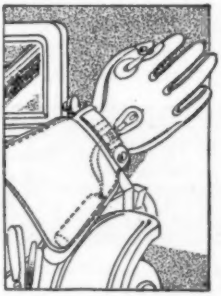


Spade for Concrete-Surface Finishing

Oilcan with Automatic Shut-Off



Anti-Vibrating Device for Gas Mantles



Signal Glove for Automobilists

A new milk-bottle opener and stopper is operated like a corkscrew and enables the paper disk to be removed without spilling the contents of the bottle. The device, which makes the use of a fork or other sharp-pointed article unnecessary in removing the

troublesome cardboard cap, can also be employed as a stopper for the bottle and is, for sanitary reasons, made entirely of metal.

At the last automobile show in New York City there was on exhibition for the first time a motor car having one headlight built into the front frame, just above the radiator, instead of two lamps in the usual position. The new type of lamp, which may be equipped to use either acetylene or electricity, is shown in one of the illustrations.

By the use of an ingenious egg cooker, which is constructed upon the order of a chafing dish, eggs may be boiled, poached, or steamed at one and the same time. The eggs to be poached are dropped into little cups and the heat is obtained from a small alcohol lamp beneath the cooker.

An indoor clothes reel is 3 in. in diameter and is equipped with 15 ft. of stout braided cord wound up inside a dust-proof metal cabinet. The line is put up by drawing out the ring at the end of the cord and attaching the cord to hooks on the wall. The line is taken down by removing the cord from the hooks and rewinding it into the cabinet by turning the reel.

The blade of a new spade for cement construction, such as walls, piers, abutments and all other exposed surfaces, is designed to force back the stone from the form, thus leaving a space which is quickly filled by the freer cement, sand and water, producing the smooth surface so much to be desired in concrete construction. The projections on the blade are sufficiently high to give a suitable thickness to the smooth surface for all requirements.

A handy oilcan for engineers is provided with a funnel and automatic shut-off. The combination receptacle prevents overflowing the oil tank and spilling the liquid over the engine and other parts of the machinery.

A pendant for preventing the breaking of gas mantles by vibration has been invented. The device is so arranged that the lamp is partly suspended by means of a spring which absorbs the jars and vibrations, thus extending the life of the mantle without interfering with its incandescent properties.

A signaling device recently invented for motorists consists of a small red lamp attached to the back of an automobile glove with a small battery in the lower side of the gauntlet. The lamp is lighted by bringing the thumb and forefinger together, the driver at the same time extending his hand out from the car's side to warn drivers behind of a turn or stop.

ELECTRIC SIGN THAT TALKS

A distinctly new type of electric talking sign which continually builds up words, letter by letter, at the right end of the sign, from a perforated tape, and

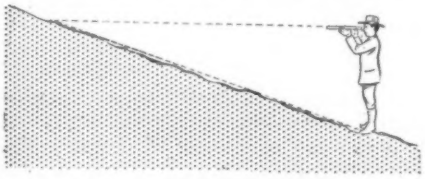
Electric Talking Sign That Automatically Reproduces New Words from a Perforated Tape

then moves them to the left end where they disappear, letter by letter, has been invented by a resident of Michigan. The device consists of a bulletin board, behind the entire display surface of which is fastened vertical and horizontal rows of lights, and a controller for producing the flashes. There is a contact on the controller corresponding to each light, and over these contacts there is permitted to pass an endless tape perforated with holes to correspond to the desired letters and words; the principle of the operation being the same as that used in player pianos, except that the action is electrical and not pneumatic. The tape or ribbon can be perforated to reproduce any style of type, or any language, symbol or design, and the copy may be changed as often as desired. The operation of the sign is entirely automatic and requires no attention other than

setting the starting and stopping mechanism, and changing the reel of tape when the display of new copy is desired.

SIMPLE METHOD OF ROUGHLY MEASURING GRADIENTS

A motorist often has cause to desire a fairly accurate idea of the steepness of a gradient, and a simple method of making a rough measurement is shown in the drawing. The person desiring to estimate the gradient takes a stick or some other straight instrument, holds it out horizontally, sights along it, and notes the point where an imaginary line extending from his eye would hit the ground. Assuming the height of the person, to the height of his eyes, to be 5 ft., and the distance from his position to the spot where the imaginary line from his eye hits the ground to be 17 ft., the average gradient would be 1 in 3 2/5.



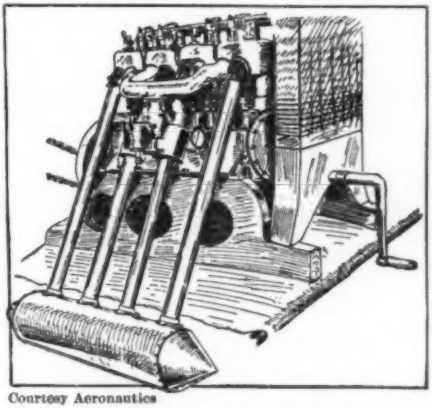
A Simple Method of Obtaining a Fairly Accurate Measurement of a Gradient

The sighting stick must, of course, be held absolutely horizontal, and it is, therefore, advisable to have a companion who will say when the sighting is correct.

AEROPLANE STARTING CRANK AND MUFFLER

An engine provided with a starting crank similar to that of the automobile engine, and also with an adequate muffler, is being used on Burgess aeroplanes. Without leaving his seat, the airman gives the motor a half turn, thus starting it. The magneto used is so constructed as to give as hot a spark when retarded as when fully advanced, thus making it possible to start the motor with the magneto.

The muffler, which is located just beneath the lower plane, is said to be so effective that the only noticeable noise is that made by the chains driving the propellers. The portion of the plane through which the exhaust pipes pass to the muffler is formed of aluminum plates. It is claimed that the muffler does not reduce the power of the motor more than four or five per cent.

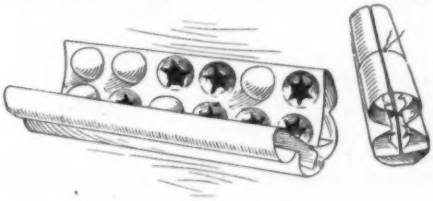


Courtesy Aeronautics

An Aeroplane Engine Provided with Simple Starting Crank and Muffler

EGG CRATE FOR THE COAT POCKET

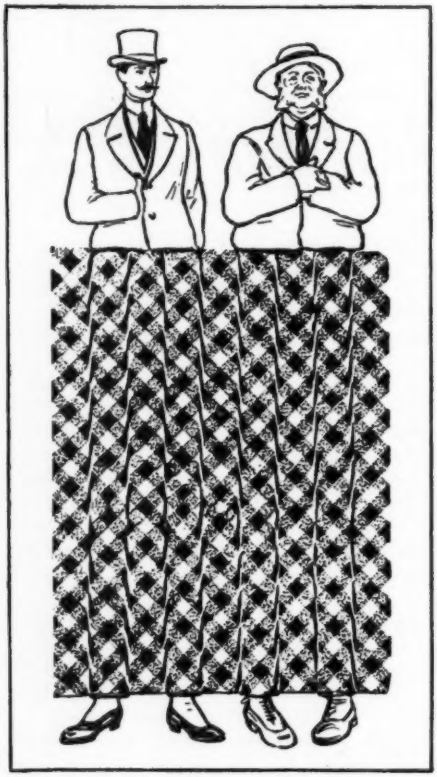
This pasteboard carton for holding a dozen eggs should appeal especially to the commuter who desires to take eggs home in his pocket rather than carry the package by hand, although the carrier is equally useful otherwise. The carton opens and closes like a book; contains but two rows of holes, and is, therefore, sufficiently narrow to slip into the ordinary coat pocket with ease.



Carton for Carrying Eggs

AN ILLUSION OF BOWLEGS AND KNOCK-KNEES

Were it not possible to immediately prove the assertion, it would seem almost foolhardy to insist that the bow-



Appearance to the Contrary, These Legs are Perfectly Straight

legs and the knock-knees of the figures here shown are really only an optical illusion. By holding the page horizontally, near the level of the eyes, and sighting along the outlines, the legs will be found perfectly straight.

¶The professor of chemistry at the Royal Academy, London, has found that the surest way of determining the age of a painting is to analyze the pigments. The ingredients used by the painters, as well as the proportions, have been found to vary in the different ages of painting.

COLUMBIA-RIVER DAM TO PRODUCE 300,000 HP.

To harness the Columbia River, at Five Mile Rapids, about 190 miles from its mouth, thereby establishing the largest water-power plant in the world, is the plan of Oregon's state engineer. The cost of this undertaking is estimated at $23,000,000. It is proposed that Oregon and Washington, having equal shares in the water of the Columbia, shall each pay half of this amount.

The plan calls for the construction of a dam at the head of the Columbia River gorge, the diversion of the stream through a canal about a mile and a half long, and a power house containing 21 turbines of the largest type now manufactured. The output of this plant will be 300,000 hp., which is one-tenth of the total horsepower developed in the world, according to the report of United States Commissioner of Corporations. Power can be furnished near-by consumers through electric transmission, at $9 per horsepower year, it is stated.

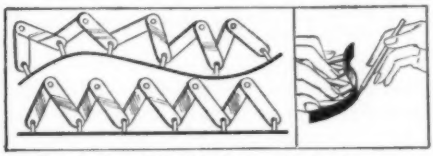
With the canal cut through solid rock a fall of 74 ft. can be secured at low water. The river at this point has a mean annual flow of 235,000 second feet, as compared with about 73,000 near Keokuk, on the Mississippi River, 220,000 at Niagara, 664,000 at the mouth of the Mississippi and 115,800 on the Nile.

The dam at the end of the canal will be 150 ft. high and similar to the proposed emergency dam in the Panama Canal. It will consist of a number of wickets or steel beams, dropped from an overhead support to a nearly vertical position, fitting into a concrete shoulder at the bottom of the channel. Down the face of these beams will be rolled a heavy steel curtain. During flood times this curtain can be raised and the wickets removed, leaving no obstruction in the water.

Detailed plans for this plant have been drawn and numerous industries in the east and in Europe are ready to build plants on the Pacific Coast if the project is carried out.

FLEXIBLE CURVES FOR DRAFTSMEN

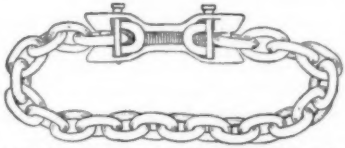
The draftsman's curve shown in the right-hand sketch is a flexible strip of steel, provided with tabs at intervals along its entire length. Up to the 8-in. size the curve can be held down in position by placing the fingers of one hand on the tabs while the pen is used with the other. In the larger sizes the tabs are secured by weights or drawing pins. The curve in the left-hand sketch has a steel strip, and any shape given to it is retained by means of the stiff-hinged linkwork attached to the tabs. As this curve is self-clamping and reversible, it can be used for making symmetrical drawings and also for transferring the outlines of moldings, etc.



Two Styles of Flexible Curves for Draftsmen

DEVICE FOR CHAIN REPAIR OR ADJUSTMENT

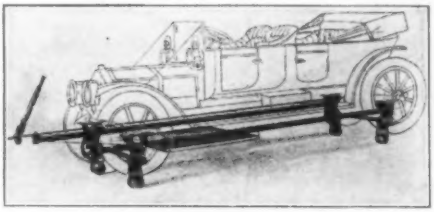
A simple appliance for joining a broken chain, forming an endless chain, or for shortening a chain to any desired length, is here shown. It may be used either temporarily or permanently in mending a broken chain, and is claimed to be much stronger than the largest-diameter chain it will take. Tying a knot in a chain to shorten it is hardly ever satisfactory, as such a method seldom gives the exact length required, but by the use of this device the adjustment can be made with accuracy.



An Appliance for Joining Broken Chain and for Shortening Purposes

AUTOMOBILE LIFT THAT IS EASY TO OPERATE

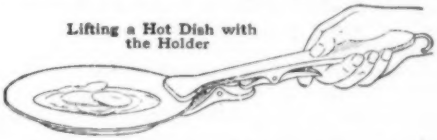
An automobile lift that enables the car to be raised and lowered easily and quickly, and which will hold the vehicle rigidly at all times, is here shown. When the lever at the end of the lift is turned the four short legs under the frame are forced into an upright position, thus raising the frame and the car. The legs have ball-bearing casters which enable the vehicle to be moved around easily.



An Automobile Lift Whose Operation is Easy, Quick, and Positive

A HOT-DISH HOLDER

Among the recent kitchen utensils placed on the market in France is a holder designed for removing hot pans from the oven or lifting hot dishes. The method of using it is clearly shown in the drawing, pressure of a finger against the pivoted lever holding the rim of the dish or pan firmly in the jaws.

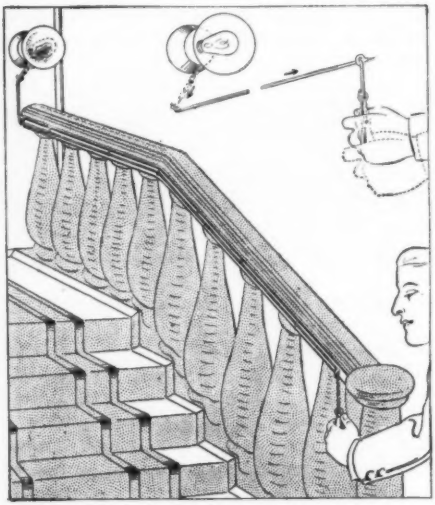


Lifting a Hot Dish with the Holder

FISHLINE CONTROL FOR STAIRWAY LAMP

Seeking an economical way of making it possible to turn off an electric lamp either at the lamp itself, which was located on the landing, or at the foot of the stairs, one inventive person hit upon the idea of utilizing a fishline. He ran the fishline through eyes

screwed into the under side of the stair railing, attached one end to the pull-chain of the lamp socket, and at-



Fishline Control for Stairway Lamp

tached the other end to a handle, which was hung under the railing at the foot of the stairs. A slight pull turns the lamp on or off.

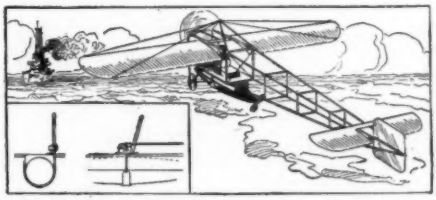
SHOCK-ABSORBING PLATFORM FOR RAILWAY CARS

An improved system of construction for protecting the ends of a railroad-car body in collisions and wrecks has been designed by a resident of Ohio. The construction is such that, in case of a severe shock, the platform and vestibule will collapse, forming a cushion space of almost 8 ft. between two cars, before the car bodies come together. In a train containing eight coaches this space would be more than 50 ft. of cushion construction, or, it is claimed, sufficient to absorb the shock and consequent damage before the cars containing the passengers could be seriously disturbed. This result is accomplished by fastening extension platforms to the center sills of the car body with rivets in such manner that these will shear when the car receives a shock of unusual severity. The steps, vestibule doors and hood will also collapse when the rivets shear, thus tending to further absorb the force of the collision. The entire end of the car body is covered with a heavy steel plate which extends from the upper portion of the roof to the bottom of the end sill; this plate being provided for further strengthening the end of the car body, to hold the end posts in position and prevent parts of the vestibule from piercing the end of the car. The entire platform, vestibule, hood and sill extension's are made in one piece and may be attached to the car at any time after it is built.

PROJECTING SUBMARINE TORPEDOES FROM AEROPLANES

Admitting that the scheme is beyond the capacity of the ordinary aeroplane at present, but firmly believing that aeroplanes can be built that would be adequate, Rear Admiral Bradley A. Fiske, in command of the First Division of the Atlantic fleet, has invented a method of, and apparatus for, directing and delivering a self-propelled submarine torpedo from an aeroplane.

The torpedo, which may be of the Whitehead or fish type, is held in a rigid, horizontal position in a belt under the lower frame of the aeroplane. In making the attack, the airman flies at a comparatively high elevation to a point about two or three thousand feet from the enemy's battleship, then



The Submarine Torpedo in Position. Insert Shows Method of Attachment

swoops downward as rapidly and as nearly vertically as possible until within 10 or 15 ft. of the water, meanwhile directing his flight so that, on reaching the desired low elevation, the

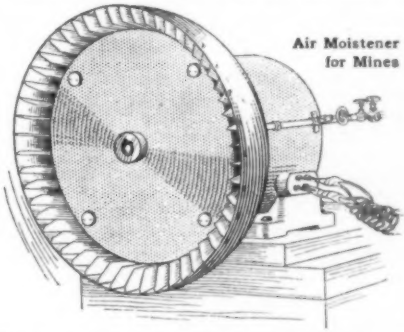
nose of the torpedo bears upon the battleship. The throwing of a lever sends the torpedo on its mission, first starting its propelling mechanism and then dropping it into the water. From then on the torpedo performs its work in the usual way.

"The advantage of approaching the enemy's battleship at a relatively high elevation," says Rear Admiral Fiske, "and then swooping down to a low one for the release of the torpedo, is that it is practically impossible with present guns to hit an object swiftly falling from a height, owing to the resulting rapid change in range and consequent elevation of the guns.

"At the present time," he continues, "the torpedo boat has practically no chance to inflict disaster upon a battleship in the daytime. To such an extent is this true, that one never thinks of a destroyer attacking a battleship in the daytime, except under very peculiar circumstances. In the night, on the other hand, the battleship has very little chance against the destroyer, if the latter gets within torpedo range. It is the aim of my invention to attack the battleship in the daytime with the same kind of a torpedo that a destroyer carries, the approach being accomplished in such a manner that the guns of the battleship would have very little chance of hitting the aeroplane."

MACHINE FOR LAYING DUST IN MINES

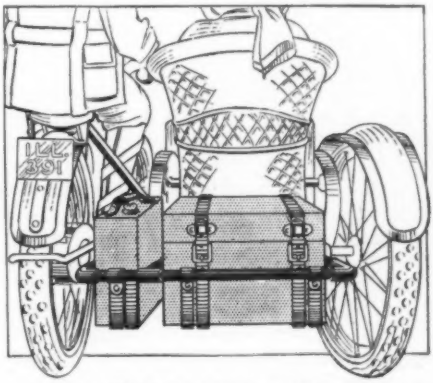
To effectually lay the dust in mines, cement mills and other industrial plants where dust-laden air is objectionable or dangerous to the health of workmen, a new type of air moistener has been designed by an engineer of the United States Bureau of Mines. As shown in the illustration, the device consists of a hollow wheel mounted upon the shaft of an electric motor, which serves to rotate a steel fan set within the larger end of the machine. When the fan is set in motion and water is permitted to enter the hub of the wheel or drum, the water is drawn forward by suction and forced, under a pressure of more than 200 lb. per square inch, out through the nozzles in



the form of a fine spray. The spray is still further broken up and diffused in the form of vapor by means of a secondary current of air, generated by another set of fan blades on the back of the wheel, and driven out between the rim of the fan and its surrounding box.

LUGGAGE FRAME FOR SIDE CARS

An exceptionally practical and neat luggage-carrying arrangement for the side-car type of motorcycle is here shown. The frame into which the luggage is set, supported by straps, is divided into a large and a small section,



A Neat and Practical Luggage Arrangement for Side Cars

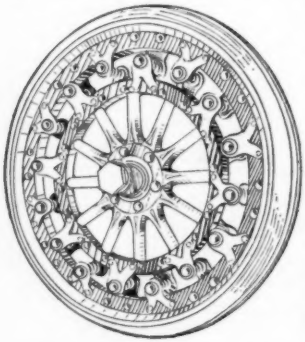
the larger section accommodating a trunk or box, and the smaller being for an extra can of oil, or similar article.

PACKAGE RECEIVER UNDER MAIL BOX

In hotels, apartment houses and office buildings equipped with mail chutes the mailing of articles too large to go into the box usually involves leaving such packages on the floor or on top of the box, with much danger of loss by accident before the postman arrives. A Chicago hotel has solved the problem by attaching a large ornamental metal tray below the mail box.

ONE OF MANY SPRING WHEELS FOR AUTOS

The particular merit claimed for the spring wheel shown in this illustration is that the springs are so designed and located that, no matter how the load is applied, it is uniformly distributed over the entire number of springs at the same time. Any load or shock which has a tendency to distort the wheel or tire produces a movement of the outer and inner rims with reference to each other, that causes a slight elongation of all the springs.

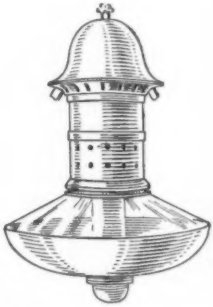


HEAT RECEIVED BY EARTH FROM THE SUN

One square yard of the earth's surface receives each day averaging six hours of sunshine an amount of heat equal to that contained in 1.8 lb. of coal, according to an Italian chemist. At this rate one square mile would receive each day heat equivalent to the combustion of more than 2,600 tons of coal; or during the year an area of about 1,200 miles receives an amount of energy from the sun equivalent to the 1,100,000,000 tons of coal and lignite mined annually in the United States and Europe.

INDIRECT LIGHTING WITH ARC LAMPS

An arc lamp equipped for indirect lighting has made its appearance in London. An enameled-iron reflector is attached to the lower part and an inner glass globe is provided to keep the reflecting surface free from dust. As there is no wandering of the arc, which is kept perfectly steady by the inclosed gases, an unusually effective distribution of light is obtained.



MOTORCYCLE FREIGHT RATES TO BE REDUCED

The present freight rates charged for carrying motorcycles by all railroads west of the Mississippi River will be reduced in accordance with a recent decision of the Interstate Commerce Commission, which rules that this class of vehicle shall be shipped at the same rate as bicycles in the future. The railroads affected have also been ordered to refund all freight charges collected for the past two

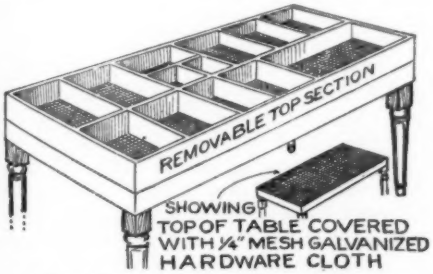
years in excess of the rates charged for transporting bicycles. The motorcycle manufacturers and dealers, in order to obtain their refund, however, must file with the Commission the dates of the shipments, the amount of the freight bills and the excess charges.

PARISIANS WORE CREPE AT HORSE-OMNIBUS FUNERAL

The passengers, driver and conductor wore crepe bands on their arms and hats when the funeral or last journey of the horse-omnibus in Paris took place recently. The old vehicle was decorated with wreaths by the great crowd that had assembled to witness the suppression of the city's last bus line, and the motormen of a line of new automobile omnibuses sat with caps in hand and played a funeral dirge upon horns as the horse-omnibus started upon its final trip.

"DUSTLESS" TABLE FOR HARDWARE DISPLAY

The proprietor of a hardware store in St. Louis has devised what he calls a "dustless table" for the display of the many small articles that make up much of the stock of such establishments. The table proper has a wire-screen top, over which is placed a wooden frame divided into sections, or compartments, of different sizes. Each morning when

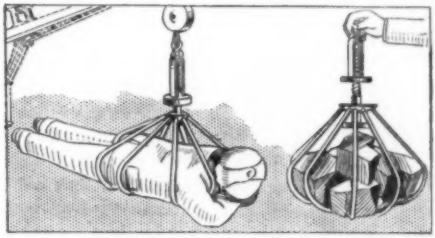


A Table through Which the Dust, Brushed from Articles on Display, may Drop

the articles in these compartments are dusted, the dust falls through onto the floor, from which it can easily be brushed up.

GRAPPLE ADJUSTS ITSELF TO OBJECTS OF ANY SHAPE

A grappling hook that automatically adapts itself to the shape of any object



A Grapple Which Automatically Adjusts Itself to the Shape of the Object Lifted

or objects it is used to lift, whether they be round, square, oblong or irregular in outline, is here shown. It consists essentially of two round plates, one of which is fixed and mounted upon a tube on which the other slides. The fixed plate carries 10 hooks, each independent of the others. A pawl-and-ratchet arrangement permits the hooks, which are held in notches cut in the edge of the sliding plate when the grapple is thrown out, to adjust themselves to the form of the object to be lifted and instantly locks them in this position, through the operation of the sliding plate, when the grapple is lifted.

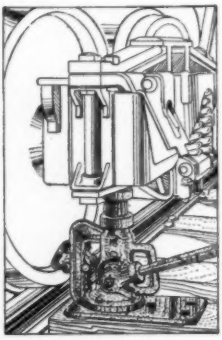
ENORMOUS HORSEPOWER IN ONE CYLINDER

Although at present the maximum horsepower derived from any single cylinder of an internal-combustion engine is, as far as present available knowledge goes, not more than 500 hp., a German firm announces that it is now prepared to turn out an oil-burning engine of the marine type that will develop 4,000 hp. in one cylinder. The new engine is said to be of the two-cycle, double-acting type.

¶A new type of disappearing bed that can readily be attached to an ordinary closet door and moved into the closet when not in use, has been put on the market. It measures 3 ft. in width and is 6 ft. 10 in. high.

JOURNAL JACK HAS WHEEL-HOLDING DEVICE

The feature of particular interest in this ball-bearing jack, designed for use in the inspection, removal, or replacement of the journal brasses of passenger and freight cars, is the device which holds the wheel firmly on the track while the journal box is being raised. This does away with the necessity of wedging down the wheel on the track.

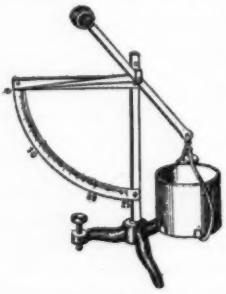


GERMAN PAPER CLOTH

A new German paper cloth, said to be practicable for a variety of uses, is made by depositing a thin sheet of pulp on a felt, placing a sheet of cotton or linen cloth upon the pulp, and then depositing another sheet of pulp upon this cloth, the whole being run through a special machine. The pulp and cloth mix so intimately that the whole forms a solid and compact sheet.

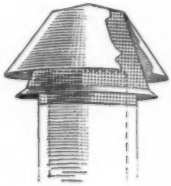
MEASURING THE WATER IN BUTTER

This little apparatus for measuring the percentage of water in a consignment of butter operates in the following manner: Hung from the lower end of the balance beam is an aluminum cup and a small weight. The pointer is brought to the zero mark on the scale by turning the thumbscrew in one of the legs, which tilts the support. Then the little weight, hung on the balance beam with the cup, is removed and the device again balanced by placing sufficient butter in the cup to equal the removed weight. The cup is then taken from the balance beam and the butter heated until all the water is evaporated, which is accomplished when the butter begins to turn brown. When the cup is replaced on the balance arm the pointer directly indicates on the scale the per cent of water in the butter.



CHOKING THE WIND FROM A VENTILATOR

A device that, it is claimed, solves one of the most difficult problems in ventilating engineering—that of interference of wind with the steady intake of air on the intake roof pipe—has recently been perfected. The device is simple and has no moving parts to get out of order, consisting only of a ventilating head of special design placed at the upper end of an intake pipe, and in this head a candle can be burned without being blown out by prevailing winds. Within the ventilating head is a reservoir of still air, from which, regardless of the direction or intensity of the wind, a uniform supply of air is drawn for ventilating purposes. A conical wire-mesh screen, partially covered by a metal weather shield, and inclosing a baffle ring and collar, comprise the ventilating head.



In spite of its simple construction this device was an exceedingly difficult thing to work out, as its success in operation depends on an exact relation between the area of space under the weather shield, the size of wire and area of openings in the wire mesh, and the size and location of the baffle ring. The air pipe is carried to a point below the basement level, from which, in steam-heated buildings, individual pipes are led to openings behind the

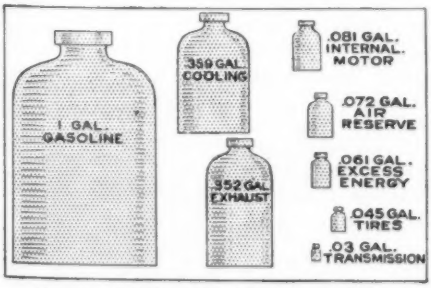
radiators. With furnace heat, direct connection is made with the return pipe at the point where it enters the furnace, and a uniform volume of fresh air is supplied through the registers. An additional means of insuring uniformity of air current is a double wall to the intake pipe, warm air from the building passing up between the two walls of the pipe, and the cold air coming down the center.

NEARLY THREE THOUSAND PATENTS EACH MONTH

The number of applications for patents received by the U. S. Patent Office during the fiscal year ending June 30, 1912, was 69,236, and the number of patents granted was 34,200. During the past five years the number of patents granted annually has not varied to any considerable degree. On July 1 of last year, there were 21,059 patent applications awaiting decision.

MOTOR-CAR LOSSES EXPLAINED

The amount of power lost by an automobile motor which develops a certain horsepower when turning at the number of revolutions required to propel the vehicle at a given speed is best explained by using a gallon of gasoline as the basis of computation. Of this quantity only .081 gal. actually serves to propel the car, while the balance is

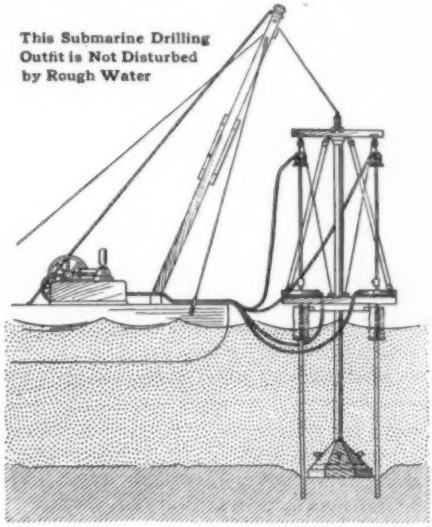


Sources of Automobile-Motor Power Losses

used up for other purposes in the manner described in the accompanying illustration from Motor Car.

DRILLING SEA BOTTOMS IN ROUGH WATERS

Ship channels often must be deepened by drilling rock bottoms and blasting, an operation always more or less



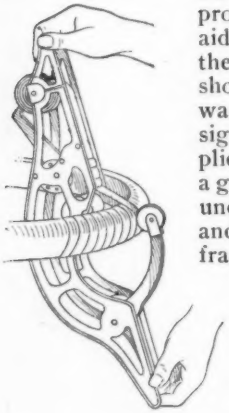
This Submarine Drilling Outfit is Not Disturbed by Rough Water

difficult, particularly where the water is liable to be rough, and a Hawaiian engineer has therefore attempted to meet this problem by means of the apparatus shown in the diagram. It comprises a drill standard, or mast, having a heavily weighted base, designed to be lowered overboard to rest on the sea bottom. Adjustably mounted on this mast is a platform, from which drills are operated by means of power transmitted from the drilling vessel through flexible connections. The result of this arrangement is that rising and falling of the drilling vessel in rough water does not in any way affect the working of the drill.

¶Aviation is rapidly becoming popular in Morocco and the French military pilots there are daily making cross-country flights, covering in one hour distances which it took the French troops three weeks to traverse last spring.

DEVICE FOR BANDAGING AUTO TIRES

The wrapping of a tire casing with tape, a frequent and not altogether easy operation if properly done, is aided by the use of the device here shown. The machine was especially designed for the application of a bandage to a casing undergoing repairs, and consists of a frame, 30 in. long and weighing about 16 lb. The bandage tape is carried on a spool at one end of the frame, and is conducted over two rollers, to keep it straight as it is wrapped and tightened around the casing. A brake keeps the tape taut on the spool, preventing all slack.



REVIVING VICTIMS OF ELECTRIC SHOCK

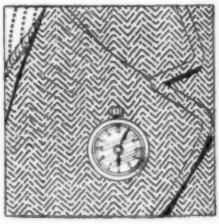
In reviving persons that have been shocked by an electric current the rescuer should first break the circuit by a single quick movement if that has not already been done. This can be accomplished without receiving a shock by using a dry coat, a dry rope, a dry board or stick, or any other dry non-conductor. Metal or any moist material should not be employed for the purpose and the rescuer should use but one hand, if the aid can be practically so rendered. The best protection possible to use while handling a victim of shock is rubber gloves or rubber cloths, but if these cannot be obtained quickly, dry cloth will answer. After the victim has been released from the current he should be laid upon his stomach, with arms outstretched above his head. The rescuer then kneels, straddles the subject's thighs, and faces his head. The palms of the rescuer's hands are placed on the small of the victim's back, with thumbs nearly touching each other, and with fingers spread over the lower ribs. With arms held straight the rescuer should swing forward slowly, so that the weight of his body is gradually brought to bear upon the subject. This movement should require from two to three seconds, and it should not be violent, as some of the internal organs might be injured. The lower part of the chest and also the stomach are thus compressed, and the air is forced out of the lungs, causing the victim's breathing to be restored.

CALIPERS TO INDICATE CENTER

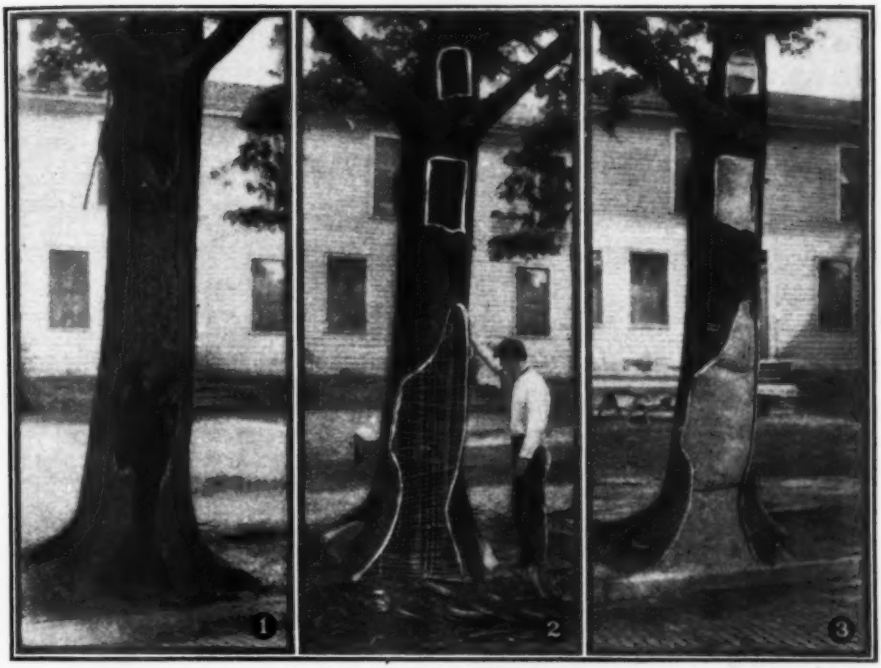
An interesting and handy tool is found in a new type of calipers which instantly indicate the center of any round or square object on which they are placed. The center is automatically found to be at the point touched by the centering rod when the legs of the calipers are closed on the sides of the shafting or other object; it will also indicate on oval objects. A spring in the center pin permits action without any adjustment.

BUTTONHOLE WATCH FOR COAT LAPELS

The market is flooded with watch novelties for women. Here is one for men. It is a little buttonhole watch claimed to keep excellent time, designed especially to be worn on the lapel of the coat.



¶The electric-railway trackage throughout the United States at the end of 1911 was 41,028 miles, and 91,457 cars were in operation.



The Tree in Need of Surgery — The Decayed Portions Removed and the Lower Cavity Reinforced — The Completed Operation

THREE STAGES IN TREE SURGERY

An unusually fine example of tree surgery, showing the decayed tree, the stages of preparation, and the completed operation, is here illustrated. The tree in question was decayed and eaten into by boring insects.

How and why such an operation as this will save a tree is often asked and quite easily answered, when it is understood that the live part of a tree trunk is directly underneath the bark, while the center of the trunk is often dead wood, the only purpose of which is that of support. The growth of the tree takes place immediately under the bark, a new ring or layer being produced each year. Therefore, if the center of the tree becomes decayed, all that is necessary is to remove the decayed portion with a chisel, spray the inside of the cavity with an antifungous preparation to check any remaining rot, apply a heavy waterproof paint, put in place the reinforcing wire, and fill the cavity with cement. The bark will completely heal over in time, under ordinary conditions.

TRANSPORTING A REGIMENT BY MOTOR TRUCKS

Plans for transporting a regiment of soldiers from Fort Benjamin Harrison, near Indianapolis, to the Pacific Coast and back again on motor trucks next year have been perfected and will be submitted to Congress for approval. The journey, if made, will be the largest experiment of the kind ever undertaken by the War Department and will cost approximately $450,000.

¶Asphalt was known to the ancients and this material is said to have been employed as a binder in masonry by the Babylonians.

CUPS FOR WOUNDED BALKAN SOLDIERS

The five cups here shown are samples of 2,000 receptacles made in England and sent to the seat of the Balkan war for use by the sick and wounded soldiers. It will be observed that each of the cups for the united Balkan states bears an imprint of the Red Cross, while the specimen of those intended for Turkey bears the Red Crescent, the emblem of the relief society of that country.

Courtesy The Sketch
Samples of 2,000 Cups Recently Sent to Sick and Wounded Soldiers of the Balkan War

AUTO SERVICE ACROSS THE ALPS

An electric automobile service has been established across the Alps at a cost of approximately $500,000. The line, which is about 25 miles in length, extends from Airolo, Switzerland, through the Bedretto Valley and the Nüfenen Pass, and ends at Ulrichen in the Valais region, on the Italian side of the Alps. The automobiles have a capacity for 22 passengers and make the trip in one and three-quarter hours on express service, running at the rate of 12 to 22 miles an hour. The company has 10 stations along the route and three trips are made daily in each direction when there is no snow on the road to interfere with the passage of the vehicles.

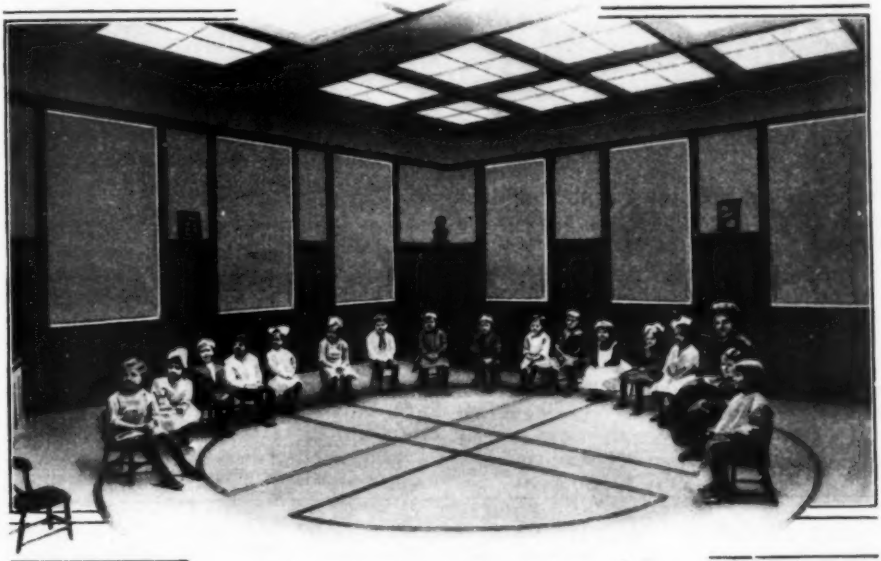
THE "STANDARD SCHOOLS" OF RURAL ILLINOIS

Inspecting the country schools as regards grounds, building, furnishings, heating, ventilation, library, water supply, and sanitation, as well as to the qualifications of the teachers, and the granting of a "Standard School" diploma to the schools found to be fit in all these respects, is the method adopted by the Illinois State School authorities as an incentive to improvement.

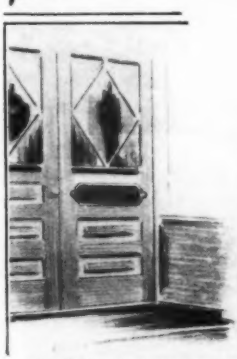
With the presenting of the diploma goes a placard or name plate. This is of steel, covered with a black preparation, and bearing the legend "Standard School" in gold lettering. Placed on the door of the school, it may be read several hundred feet away. Some 657 of the 10,532 one-room country schoolhouses in the state have already earned the right to display these plates.

Among the specifications of a "standard school" are: an ample playground, good approaches, convenient fuel houses, a sound, well-painted building in good repair, a jacketed stove in the corner of the room instead of an unprotected stove in the center, the floor and interior clean and tidy, suitable desks for children of all ages, properly placed; a good collection of maps, dictionaries and juvenile books, and a sanitary water supply. In addition, the school must be well organized, with regular attendance and at least seven months' schooling each year, and the teacher must have not less than a high-school education, receive a salary of at least $360 per year, and be ranked by the county superintendent as a good or superior teacher.

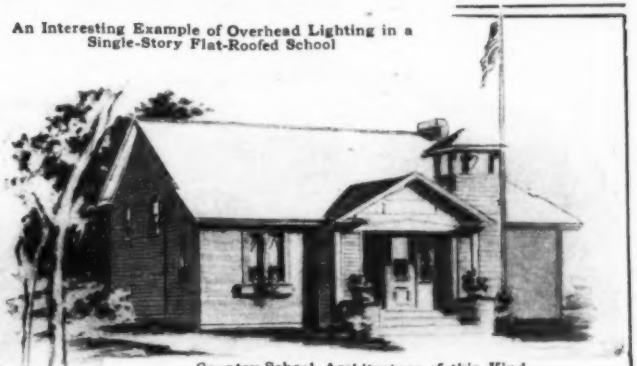
An Example of Faulty Heating. The Stove should be Jacketed, as Shown at the Right, and should be Placed in a Corner Instead of in the Center of the Room



An Interesting Example of Overhead Lighting in a Single-Story Flat-Roofed School



The "Standard School" Placard is Coveted in Illinois



Country-School Architecture of this Kind Suits the Illinois School Authorities

MACHINE THAT HEATS ASPHALT MIXTURE

A road-making machine that heats the asphalt while it is being mixed has been placed on the market. The hot mixer is so constructed that the flame from the fire box of the boiler is forced into the mixing drum through an asbestos-lined heating pipe by means of a powerful blast. A slide valve at the boiler permits accurate control of the heat and, by means of a damper in the hood of the boiler, the draft can be diverted through the stack when the heat is shut off from the mixer. The heating attachment is swiveled on a cast-steel elbow, so as to swing to one side when the drum is tilted. The heat produced in the drum averages above 600 deg. F., and the materials are "sprayed" by the blades in the drum, thus permitting the heat to reach every particle in the mass. It is claimed that a batch of material can be heated and mixed by this machine in about two and one-half minutes.

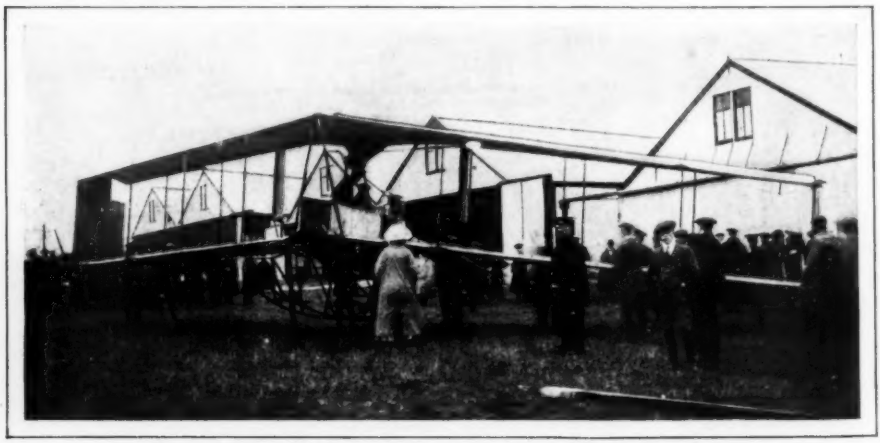
Road-Making Machine That Heats and Mixes at Same Time

WESTERN RAILROAD TO OPERATE WIRELESS

The Union Pacific Railroad is to operate a wireless telegraph system along its lines. The first installation will be a technical experiment station, said to be the second of the kind in this country, and other stations will be erected later. Application has been made to the Department of Commerce and Labor for a license to maintain the wireless system.

V-SHAPED AEROPLANE FLIES WELL

One of the V-shaped aeroplanes recently developed in Europe has been flying exceptionally well in England, particularly in a strong wind. It has no tail, the engine and propeller are both located at the rear, and there are two rudders, placed at the ends of the "V." It is claimed that this machine has sufficient automatic stability to right itself without the use of the ailerons.



A V-Shaped, Tail-Less Aeroplane That is Making Successful Flights in England

Copyright by Underwood & Underwood, N. Y.

Nature's Monument to France's Futile Attempt to Build the Panama Canal

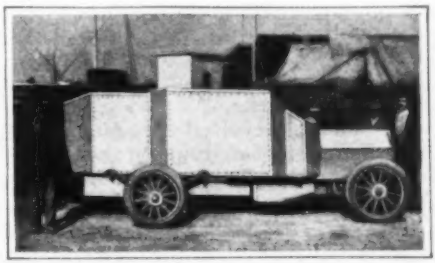
NATURE'S MONUMENT TO FRANCE'S FAILURE

One of the most unusual photographs of nature's freaks, that describes better than words the futile attempt of the French to build the Panama Canal, is here reproduced. In 1888, when the French discontinued further attempts to build the canal, after having spent approximately $280,000,000, they were so utterly discouraged that the costly machinery was left along the route of labor to rust and turn into junk. As time passed by, a tree, which had taken root near the tilting dump car here pictured, grew until it had entwined itself about an iron rail of the vehicle. The tree continued to increase in size until the rail finally became a part of the tree. When the gates are finally closed this tree and car will lie at the bottom of Gatun Lake.

¶The production of copper in the United States during 1912 was 1,249,000,000 lb., worth $200,000,000, an increase of 151,000,000 lb. over 1911.

ARMORED MOTOR CRUISER IN ACTUAL WAR

The Turko-Italian war, whatever else it accomplished, provided a few actual tests for modern implements. Much publicity has already been given to the actual use of dirigible balloons and aeroplanes, and in the accompanying illustration is shown one of the armored motor cruisers which was extensively used in the campaign. This machine carries a rapid-fire gun, and is manned by the driver, a gunner, and two officers.



An Armored "Cruiser" Automobile Used in the War in Tripoli

GIANT THERMOMETER MARKS CINCINNATI'S CHARITY

Interest in the collection of a fund for charity was recently incited in Cincinnati by indicating the collections

Courtesy Bain News Service, N. Y.
Cincinnati's Charity Record

from hour to hour upon a huge thermometer which was erected in one of the public squares. The force of collectors was divided into two teams—one being composed of men and the other of women. As fast as a subscription was received the amount was telephoned to subscription headquarters and the "mercury" immediately went up.

¶It is believed that the demand for steel rails during this year will reach the enormous total of 3,000,000 tons.

MAKING PLANTS ABSORB MORE IRON

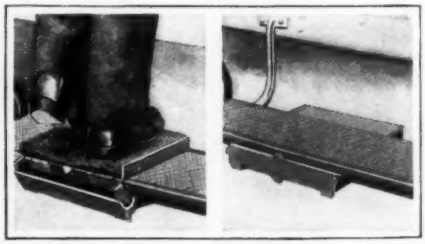
Officials of the agricultural experiment station in Vienna, Austria, are conducting experiments with a view to increase, if possible, the amount of iron absorbed by certain plants, for the purpose of ascertaining the effect on the human body when these plants are used as food.

As artificially prepared foods containing iron do not always produce the desired effect, because the iron is not completely used by the digestive organs, it is hoped that this difficulty may be overcome by forcing plants to take up a larger quantity of iron during their growth.

The experimenters have already succeeded in growing spinach containing approximately seven times more iron than is found in the ordinary spinach, by adding hydrate of iron to the soil, and it is believed that the process may be successfully used with other plants of the same class.

INGENIOUS FOOT WIPER FOR AUTOMOBILES

An ingenious foot wiper for attaching to the footboard of an automobile is so constructed that, by lifting the brush part up and outward with the foot, the brush is caused to slide automatically under the footboard. The wiper is brought into the proper position for use by drawing it forth from its place beneath the footboard by means of a handle attached to the outer edge of the plate upon which the brush is secured.



Automobile Foot Wiper in Use and under Footboard

FORTUNES IN PRIZES WAITING TO BE WON

[Every little while a report gains currency that a million-dollar prize has been offered for the performance of some impossible mathematical feat or the invention of some contrivance of problematical value. Many innocent persons have been deluded into spending their time and money in the pursuit of these phantom prizes. Feeling certain, however, that there must be many genuine prizes waiting to be won, Popular Mechanics Magazine communicated with the fifty-five foremost scientific organizations of America, the one hundred largest industrial and trade associations and the ninety principal learned societies of foreign countries. If there are any prize offers of value not disclosed in the information thus collected, the editor would be glad to learn of them.—EDITOR.]

A DOZEN fortunes, even as fortunes are reckoned today, are lying, in cash, in the treasuries of as many organizations, to be awarded as prizes to inventors, discoverers and scientists. Scores of lesser prizes, any one of which represents a splendid reward for a year or two of labor, lie unclaimed, waiting for the man who is able to fulfill the conditions of the gifts. Much of this prize money is the interest on inexhaustible funds, and is given annually or at other stated intervals. But much more of it is in single large amounts—$1,000, $10,000, $20,000, $25,000—even one great lump of $100,000 is waiting for the first person who can prove his claim to it.

There is $23,800 in Germany for the first person who presents a perfect proof of a well-known mathematical theorem. There is $20,000 in France ready to be given to anyone who finds a cure for one of the commonest diseases. And, to get nearer home, there are sums ranging all the way down from $10,000 offered in America for mechanical devices that are sure to be invented sooner or later.

Largest of the prizes awaiting inventors is the $100,000 offered by the International Association of Recognized Automobile Clubs, for the best substitute for gasoline. This prize, which was announced last December, is to be given only for some product that can be used in existing internal-combustion motors, is available in large quantities and is of such a nature that it cannot be monopolized by a trust. Other conditions are yet to be announced. Here is a prize worth winning. Experiments with benzol, with methyl alcohol and with a mixture of the two, have encouraged inventors to work along those lines, but it is possible that some American will come to the front with a new volatile hydrocarbon, or with a satisfactory method of carbureting kerosene, that will capture the big prize. And the winner does not have to yield ownership in his invention to get the $100,000, but like most of the other prizes for industrial research, this prize is a bonus, not purchase money.

Should the new fuel, when found, be capable of manufacture from some substance produced in Great Britain, there is another prize ready for the fortunate inventor, the 2,000 guineas ($10,500) offered by the British Society of Motor Manufacturers and Traders for a fuel that meets this condition. The Royal Automobile Society of England will conduct tests of all fuels offered for this prize.

Along the same line of automobile improvement is an opportunity to win $2,500 by a simple mechanical invention. This sum will be paid by the Royal Automobile Society of England for the best carburetor, the fund having been placed in the society's hands by Mr. G. K. Chamberlain, an American. This contest is open, like the others mentioned, to inventors of all the world.

The largest standing prize in America for an invention is one of $10,000 for a machine for pulling and topping sugar beets, offered by the Great Western Sugar Company of Denver. The successful device must require comparatively little power and if operated by

horses not more than four horses per beet row. It must pull and top all the beets, separate the beets and tops and leave all convenient to load. It must be adjustable and salable at retail for not more than $300, if horse-drawn, or $500, if self-propelled. If not won by March 1, 1915, the prize may be withdrawn, but the first device offered before that date that fulfills all the requirements will get the prize—and the inventor will retain the ownership of his invention.

Fifteen years ago the Louisiana Sugar Planters Association offered a prize of $2,000 for a sugar-cane harvester. Thus far none has been produced that meets all the requirements, and the prize offer has lapsed, but many inventors are at work on this line, and, as the secretary of the association writes, "whoever makes a successful cane harvester will become a millionaire very quickly, and will not need the $2,000."

The effort to convert coal waste and low-grade coal into briquettes and so utilize it economically has occupied the attention of many inventors for years. The government of New Zealand recently announced the offer of a prize of £250 ($1,250) for a more economical process of making briquettes from slack coal.

One of the largest sums available for the reward of inventive genius and application is the Pollock Prize Fund of $50,000, held by the Conservatory of Arts and Trades of Paris, to be distributed in prizes for inventions for saving life at sea. This fund was founded by the daughters of Mr. and Mrs. Anthony Pollock, of Washington, D. C., who were drowned when the French ship "La Bourgoyne" sank off the Grand Banks on July 5, 1898. Several awards, mostly of small amounts, have been made from the fund for life-saving devices, which are on exhibition in a special room at the conservatory, but there is still nearly $30,000 available for the reward of inventors of meritorious apparatus. The largest single award that has been made from this fund, $20,000, was given by the jury in 1900 to L. Colineau for the plan of constructing the "bridge" of a steamship in the form of a detachable steel barge with water-tight compartments, 40 ft. wide and extending in length the entire width of the ship.

One of the largest prizes for the protection and preservation of human life is the sum of 25,000 marks ($5,950) for the invention of an electric miners' lamp combined with a dependable device to indicate the condition of the air and give warning of the presence of a dangerous amount of explosive gases. This prize is offered by the mining interests of the Dortmund district in Germany.

Comparatively small in amount, but important because of the scientific recognition which any award by the Royal Society of Arts of Great Britain carries with it, is the prize of £20 ($100) it offers to the inventor of the best portable apparatus for enabling men to undertake rescue work in mines. The winner of this prize will be allowed to choose between the money and a gold medal. The fund from which it is provided was established in 1813 by Anthony Fothergill.

The American Red Cross has at its bestowal one prize of 6,000 roubles ($3,100); two prizes of 3,000 roubles ($1,550) each, and six of 1,000 roubles ($515) each, to be awarded, from a special fund created by the Empress Maria Feodorovna of Russia, for devices and apparatus for the amelioration of the sufferings of the sick and wounded in time of war. The American Red Cross also awards annually the William Howard Taft prizes of $50, $25, $15 and $10,

given to railroad men for services and devices for the prevention of accidents.

A certain machine in general use for splitting leather is productive of many serious accidents. A prize of $100 is offered by the National Association of Tanners for a safety device for this machine.

A prize for scientific achievement that is well worth winning is the Pierre Guzman prize of 100,000 francs ($20,000) offered by the French Academy of Sciences to the first person who succeeds in establishing communication with some planet other than Mars. Apparently the French savants believe we are to be "wirelessing" to Mars in the not far distant future!

Somewhat easier to win, at first glance, though the problem for the solution of which it is offered has baffled men of science for more than two hundred years, is the Wolfskehl prize of 100,000 marks ($23,800) offered by the Academy of Sciences of Goettingen, Germany. All one needs to do to get it is to prove to the satisfaction of mathematicians generally that Pierre Fermat was right when he wrote, in a letter of October 18, 1640, that no integral values of x, y and z can be found to satisfy the equation "$x^n + y^n = z^n$" if "n" is an integer greater than 2. That's all—just prove he knew what he was talking about and collect that $23,800! Fermat was a tax collector who pursued pure mathematics as a hobby, and his letters, published after his death in 1665, contain original contributions to the theory of numbers which prove him to have been one of the greatest mathematical geniuses that ever lived. A hundred years after Fermat's death a German savant demonstrated the correctness of all but two of the Frenchman's mathematical deductions. One of the remaining two is known in the world of science as "Fermat's Last Theorem," and a fortune awaits the first to prove Fermat right. Dr. P. Wolfskehl of Darmstadt died in 1907 and left 100,000 marks for this purpose. The mathematicians of the entire world are concentrating upon the effort to win it. Not long ago a convict, released on parole from the Missouri State Penitentiary, announced that in his seven years of imprisonment he had demonstrated Fermat's Last Theorem and was going to get the prize. A University professor of mathematics is said to have resigned his position to devote his time to the effort to win the Wolfskehl prize, and thousands of other mathematicians are at work on the problem. If no one wins the prize by September 1, 2007, the conditions of the award may be changed. Part of the accumulated interest of the fund was awarded a year ago for a partial demonstration.

Here is another brain-teaser: "What is the expression of the C. Neumann theorem in the theory of the Newtonian potential, applied to the oval-shaped solid derived from the ellipsoid by the method of reciprocal radii?" Answer that correctly and the Prince Jablonowski Society of Leipzig, Germany, will give you a prize of 1,500 marks ($357) if the solution is the best one received before October 31, 1913.

Mathematical problems are favorites among prize-giving societies of Europe. The Paris Academy of Sciences offers a long list of awards, headed by the Jean Reynaud prize of 10,000 francs ($2,000), given every five years for the most notable work in mathematics. In 1913 this society will award also the Petit d'Ormay prize of 10,000 francs for the best contribution in pure and applied mathematics, seven other prizes, aggregating 16,240 francs, for original work in higher mathematics, and the Wilde prize of 2,000 francs

for the most important contribution to science in the preceding two years. In 1914 the Paris Academy will give a prize of 3,000 francs for the best solution of a certain problem in trigonometry, and in the same year will award the Fourneyron prize of 1,000 francs for the best theoretical and experimental study of turbines.

The Royal Academy of Science of Belgium offers, for 1913 and later, two prizes of $200 each, and one of $240, for work in higher mathematics; a prize of $280 for the best paper relating to public works offered before June 30, 1913; a biennial prize of $200 for discoveries in physiology, a triennial prize of $360 for original work in general biology, a prize of $480 every six years for contributions to political economy and social science, and one of $300 every five years for the best treatise on spiritualistic philosophy based on pure reason.

A prize of $1,000 is waiting in Philadelphia for the first resident of North America who shall determine by experiment whether the invisible rays of light below the spectrum, known to science as "infra-red" rays, are or are not transmitted with the same speed as other light rays. This Boyden Premium was established by Uriah H. Boyden of Boston in 1859, and placed in the custody of the Franklin Institute of Philadelphia, to be given to anyone who would determine the relative speed of all the invisible light rays, but in 1907 part of the fund was awarded for the discovery of the relative speed of the visible rays and those above the spectrum—the "ultraviolet" rays of the scientists.

Every three years there is a chance for students of electrical science to win $4,500. This is the interest, at 3 per cent, on a fund of $50,000 deposited with the Montefiore Association of Liège, Belgium, by George Montefiore Levi, given for the best original work on scientific advancement and the progress made in technical applications of electricity.

A cash prize of no fixed amount is given every five years by the Royal Society of Sciences and Arts of Gothenburg, Sweden, for an important scientific discovery. The Royal Society of Edinburgh offers the Keith prize of a gold medal and $200 to $250 for the best communication on a scientific subject received before the end of its 1913 session. It also offers biennially the Makdougall-Brisbane prize of a gold medal and a sum of money for an essay or paper having references to any branch of scientific inquiry, whether material or mental.

Leaving out of consideration hundreds of prizes open only to members of particular organizations or inhabitants of certain countries, the list of important or curious prizes offered in Europe is still a long one. One that is not to be awarded until 1931 consists of £71.6/10 ($356.71) in British "consols" or government bonds, deposited by Sir Frederick Bramwell with the British Association for the Advancement of Science and to be given by them 18 years hence for a paper dealing with the whole question of the prime movers of 1931 and especially with the then relation between steam engines and internal-combustion engines.

Largest of the standing rewards offered for medical research is the Bréant prize of 100,000 francs ($20,000) offered by the medical section of the French Academy of Sciences for the discovery of a means to cure Asiatic cholera. The entire sum will be given to the discoverer of a genuine cure, but the interest may be awarded from

time to time in smaller prizes for work advancing the scientific knowledge of this disease.

The largest American award for medical research is the cash prize of $1,000 offered every three years by the College of Physicians of Philadelphia for an important contribution to medical science. The same institution awards annually the Alvarenza prize of $180 for medical research. The Harvard Medical School gives two Boylston prizes, of $75 each, annually, for original research in medical science.

Every two years some young architect or architectural draftsman gets the Le Brun Traveling Scholarship of $1,000 with which to spend six months in European study, offered by the New York Chapter of the American Institute of Architects. Every year the National Association of Sheet Metal Contractors of the United States gives $300 in cash, tools and books to journeymen and apprentices for ability in sheet-metal work.

The British Royal Society gives $500 every five years for works on jurisprudence, from a fund established in 1844. An annual distribution of $2,000 is made by a Chicago manufacturing company for essays on economic subjects. The American Historical Association gives every two years the Justin Winsor prize of $200 for independent research in American history and the Herbert Baxter Adams prize of $200 for original work in European history. The Boston Society of Natural History gives two prizes of $50 each every year, the Walker prizes, for essays on subjects selected by the society. And an annual prize of $20 for inventors is derived from a legacy left many years ago by John Scott, of Edinburgh, in the hands of the Philadelphia Board of City Trusts.

Greatest of all of the periodical money prizes, but not subject to competition in the ordinary sense, are the five Nobel prizes of about $40,000 each, awarded annually from a fund left by Alfred Nobel, inventor of dynamite, to the persons who have rendered the greatest service in physics, chemistry, literature, medicine and peace. The Swedish Academy of Sciences awards the first two; the Swedish Academy, the third; the Caroline Institute of Sweden the fourth, and the Norwegian Storthing, the last-named. Two Nobel prizes have come to America—a peace prize to Theodore Roosevelt for his services in ending the Russian-Japanese War, and a prize in medicine to Dr. Alexis Carrel of the Rockefeller Institute of Medical Research.

Pages could be filled with the list of American and European offers of medals for invention, research and discovery. Oldest of these American trophies is the "Magellanic Gold Medal," an oval plate of solid gold of the value of ten guineas ($50) given annually by the American Philosophical Society of Philadelphia, from a fund founded in 1786 by John Hyacinth de Magellan, of London, for the best discovery or most useful invention relating to navigation, astronomy, or natural philosophy.

To gain the Albert medal of the British Royal Society is probably the highest honor that can come to an inventor or scientist, while the John Fritz medal is the most notable American reward for research and invention. Two Americans, Edison and Bell, have each received both medals.

Such are the prizes the world offers for creative work. Fortune as well as fame is more than ever before the reward of research and industry.

Photo by Paul Thompson

Weird Funeral Procession of the Late Prince Luitpold of Bavaria

TELEPHONE POLE USED AS ORNAMENT

The illustration shows how a resident of California converted an unsightly telephone pole in front of his bungalow into an ornament by permitting vines to grow upon it, according to the Telephony magazine. The vines, it will be observed, are not allowed to reach the wires.

Ornamental Telephone Pole in California

QUAINT FUNERAL OF LATE BAVARIAN REGENT

The section of a long line of "guglemänner" or cowled men here shown is a part of the remarkable funeral procession which accompanied the body of Prince Luitpold, regent of Bavaria, during a two-hours' march through the streets of Munich. The cowled men are members of an ancient order of churchmen, whose shields are decorated with the Bavarian arms, and for centuries members of this order have marched in funeral processions of royal personages. Each of the shields bears the inscription that Prince Luitpold, the King's Regent, was born in 1821 and died in December, 1912.

USING POWER TO "PULL" IS BETTER THAN TO "PUSH"

Makers of the front-drive and tractor type of motor truck are laying considerable stress on the fact that it is easier to pull than to push a load. The same claim is being made for the four-wheel-drive type of motor truck, but with this kind of machine it is a matter of both pull and push. Among the additional claims are: less danger of skidding, a more equal tire-load distribution, and a better ability to run through deep sand, over mud and muck with a load which a rear-wheel-drive machine could not carry under the same conditions.

IN DEFENSE OF THE AUTOMOBILE

According to Sir John Macdonald, a member of the British Road Board, the wear and tear, dust and mud, of macadam roads is not altogether due to the automobile. He claims that macadam roads would be all right if the road-making rules laid down by the late Mr. MacAdam were strictly followed, instead of being more or less disregarded. He also insists that the wear of such roads is not caused by the suction of automobile tires, but almost entirely by the crushing effect of horseshoes and iron-tired wheels.

¶Coal tar is being used as fuel in one of the steel plants at Sharon, Pa.

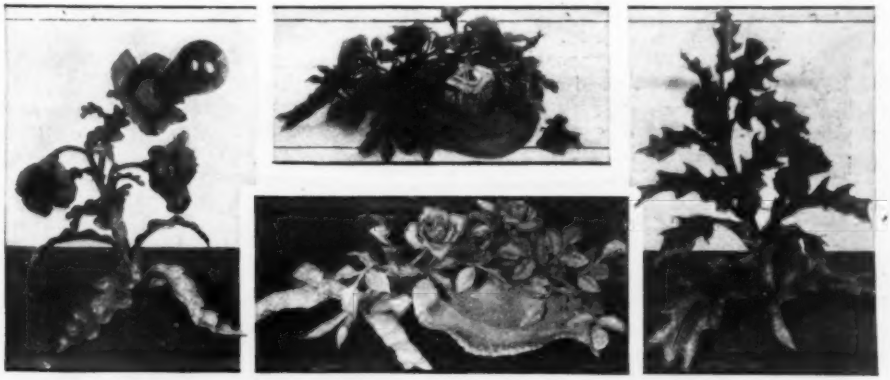
STEEL COAL CAR SHATTERED BY WOODEN GONDOLA

In a railroad accident which recently occurred near Apple River, Ill., two loaded coal cars collided and the result is here pictured. It will be noticed that the wooden car was but slightly shattered, while the steel gondola sustained severe damages, a rather remarkable result under the circumstances.

The Steel Car Sustained the Most Damage

ARTIST-BLACKSMITH MAKES FLOWERS OF IRON

These illustrations give a fair idea of the remarkable character of work wrought by a New Jersey blacksmith who fashions beautiful flowers, wreaths and festoons of blossoms in wrought iron with hammer, tongs, and anvil. The reproductions are so true to nature that art critics who have viewed his masterpieces declare his work to be that of an artist in every particular. The artist-blacksmith discovered several years ago that he had the ability to fashion designs in metal and since then has devoted all his spare time to



Specimens of Beautiful Flowers Made of Wrought Iron by a Blacksmith with Hammer, Tongs and Anvil

work of this kind. One of his more elaborate designs is a pair of doors recently completed for a public building. These doors contain historical groups, typical scenes of the Continental period, and are as intricate and delicate in detail as though cast in bronze.

COAL MINES WITH STRAY ELECTRIC CURRENTS

Stray electric currents were found to exist in certain coal mines of Kentucky during an investigation as to the cause of premature mine explosions by the chief mine inspector of that state. It was found, says the Fuel Magazine, that such explosions occurred when one end of a large copper needle used in mine-blasting operations was inserted into the loading hole and placed in contact with the powder while the other end of the needle was allowed to touch a layer of coal adjacent to the hole, or permitted near enough to it so the current could jump from the coal to the end of the needle.

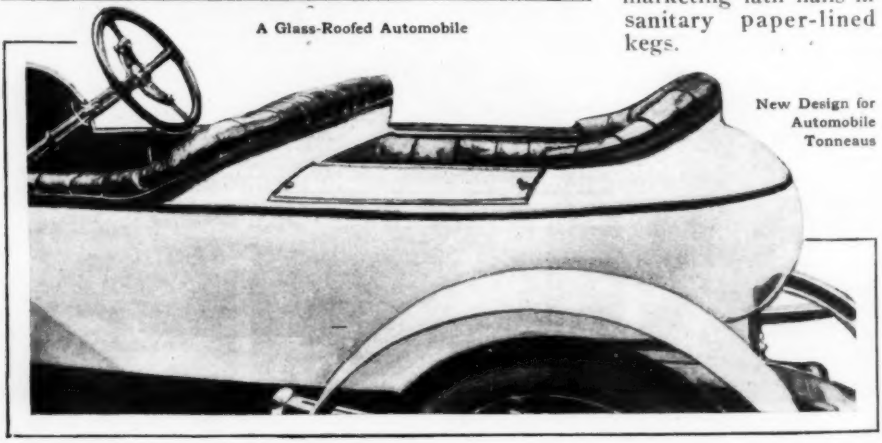
¶A lamp on the tower of the courthouse in Marion, Ind., flashes a red signal whenever patrolmen are wanted to call police headquarters by telephone. Every policeman is required to respond when the red light glows.

NEW AUTOMOBILE DESIGNS

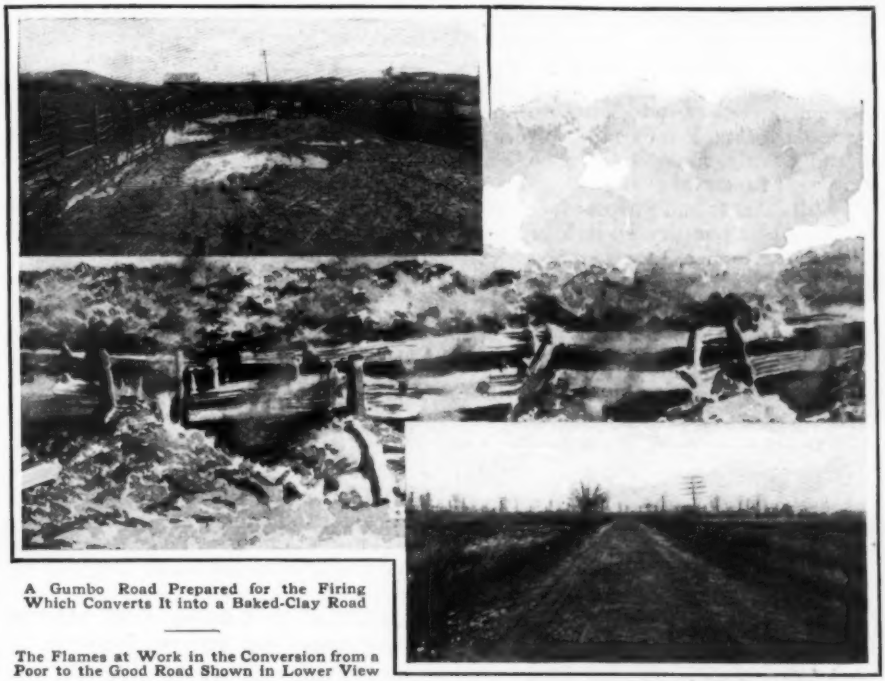
Among many other new and interesting automobile-body designs exhibited at the automobile show in Paris were the two here shown. The most radical feature of the closed car is the glazed roof. The other car has a well-like tonneau.

¶Lathers invariably use their mouths as a holder for nails, so a nail company is now marketing lath nails in sanitary paper-lined kegs.

A Glass-Roofed Automobile



New Design for Automobile Tonneaus



A Gumbo Road Prepared for the Firing Which Converts It into a Baked-Clay Road

The Flames at Work in the Conversion from a Poor to the Good Road Shown in Lower View

MAKING GOOD ROADS BY FIRING POOR ONES

Blazing a trail of good roads through the south is not a figure of speech but an actuality, for many miles of good roads are being made by setting fire to poor ones, the result being what is known as a baked-clay road.

There are no poorer roads in all the United States than the "gumbo" roads of the south—gumbo being the name given a certain kind of mud or clay that is particularly sticky, clings tenaciously, seems to have no bottom, and will not support any weight. Gumbo, however, contains a large percentage of organic matter, which will burn when dry, and, as a result, a road of this material, properly prepared and set on fire, emerges from the fiery ordeal as a "perfectly good" road, and one, moreover, that stays so for a considerable period of time.

The process of converting a gumbo road into baked clay begins by plowing up the roadway and making ditches on the sides. Cordwood is laid in a sort of flooring across the furrows, which run crosswise of the road; great lumps of sticky gumbo are spread over this floor, along with more wood, loosely strewn about, then a second floor of wood is laid, and the whole covered with gumbo, tamped and rounded off. Fire is now set to the road, and the flames, rushing through the furrows, which serve as flues, ignite the wood. After the heat has driven the water out of the gumbo, this, too, ignites, and the actual cooking process is in full swing.

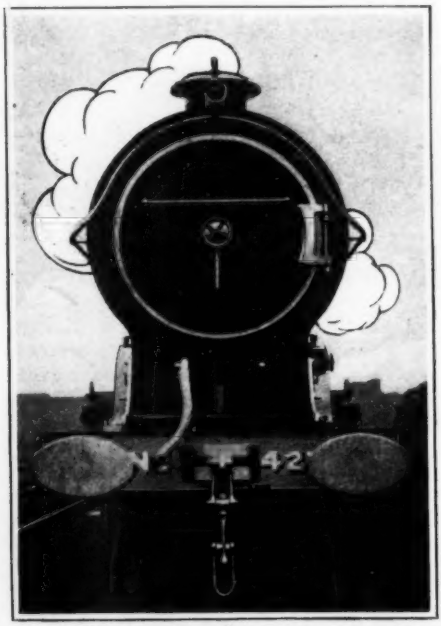
"It is more than merely drying out the gumbo," says C. H. Claudy, in Motor. "It is a peculiarity of this gumbo that, at low temperature, it clinkers. And these clinkers, when broken up, are quite different from the original lumps of gumbo. The clinker is not only fairly hard, but, if properly burned, will not make mud when mixed with water. In this is the triumph of

the burned-clay road. When the fire has burned itself out, the road maker has not only a thorough mixture of dry clay and wood ashes, but a good depth of gumbo clinker, which he promptly proceeds to break into small pieces, to spread evenly, and finally to roll and compact into a real road."

To all intents and purposes, the road so made is a fine dry stretch of crumbled brick.

ENGLAND'S "GIGANTIC" LOCOMOTIVE

England's most powerful locomotive is shown in the accompanying illustrations. It is spoken of in England as "an elephant of the railroads," as "an enormous, unique engine," and as "the latest gigantic locomotive." "This elephant of the railroads is remarkable in many ways," says one writer. "The usual outside cylinders have given place to inside cylinders, which are no less than 21½ in. in diameter and of the exceptional length of 17 ft. 3 in. The engine and tender, in working order, weigh 122 tons."



Front View of England's "Enormous" Locomotive

Railroading conditions in America, of course, are different, but it is interesting nevertheless to make some comparisons. The "big" locomotive of the Virginian Railroad weighs, with tender, 376 tons, and will draw 155 loaded 50-ton freight cars at 10 miles an hour. The "big" locomotive of the Atchison, Topeka and Santa Fe Railroad weighs, with tender fully loaded with oil, fuel and water, 425 tons, the engine alone weighing 308 tons. The total length over engine and tender is 121 ft. 7 in.

DUPLICATE CASTS OBTAINED BY USE OF GLUE MOLDS

The American Museum of Natural History, New York, which has accomplished important work in making casts of Indian and Eskimo heads from life, has evolved a particularly effective method of making duplicate casts, the feature of which is a glue mold. In the process of obtaining the mold the cast to be duplicated is first covered with a half-inch thickness of clay and then a two-piece plaster mold is made over the clay. When the plaster has hardened the mold is taken off, the half-inch thickness of clay is removed from the head, and then the model is put back in position in the plaster mold, which is like a jacket or hood,

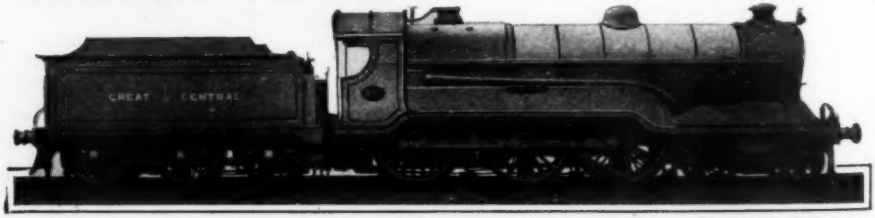


Photo by Paul Thompson

Side View of the Most Powerful Locomotive in England

1, Method of Making the Jacket, the Model Being Covered with a Half-Inch Thickness of Clay, of Which a Part has been Removed to Show the Face Underneath; 2, Model with One Half of Jacket in Place, Showing the Space to be Filled with Glue; 3, Pouring the Glue into the Jacket; 4, The Glue Mold as It Appears When Looking into It; 5, A Number of Casts

Courtesy Am. Mus. of Nat. Hist.

separated from the model by a half-inch space. This space is then filled with glue, poured in as shown in one of the illustrations. As the glue rises in the space about the model, holes previously cut in the jacket to allow the escape of air are plugged with clay, the funnels at the top and side of the jacket are also capped with clay, and the glue is allowed to stand for 12 hours. The glue mold thus obtained is firm enough to produce an accurate cast, yet yielding enough to allow its removal intact, no matter how many undercuts the features of this cast may present. A large number of duplicate casts can be made from such a mold.

A CITY WHERE AUTOMOBILES ARE PROHIBITED

The little city of Odder, Denmark, is remarkable for the fact that its four thousand people have never relaxed from their early declaration never to permit the driving of a motor car through the streets. In consequence of this united opposition there may be witnessed any day in that city the odd sight of a man, clothed in a business suit and wearing a soft hat, sitting astride a black horse, drawing the automobile of some visitor through the town. The spectacle affords amusement for the children who climb into the vehicle and accompany its occupants. A severe fine has been provided for any attempt to violate the rather unusual ordinance.

STAIR-CLIMBING MADE EASY FOR THE WEAK-HEARTED

The curious device attached to the lower foot in the illustration, although suggestive of the old patten or wooden shoe is, in reality, a steel slipper designed for assisting weak-hearted people to climb stairs by providing the foot with means for additional springiness. Only one slipper is used and it is held in position by a strap passed over the foot.

"Slipper" for Assisting Weak-Hearted People to Climb Stairs

HUGE COLUMNS OF GRANITE TO LAST 10,000 YEARS

By GUY E. MITCHELL

Granite is the most enduring of building stone. All rocks are subject to the destructive action of the elements—rain, sun and frost—but it is estimated that the best quality of granite, under ordinary building strain, will, in the average humid climate in a temperate zone, outlast 100 to 1 a common quality of sandstone. As a specific example, the great pillars of the United States Treasury building at Washington, on three sides of the structure, were cut from Maine granite quarries. There are 56 of these huge columns, each 39 ft. in height, but on the east side of the building, which was intended to be the back, sandstone pillars were used, quarried from a sandstone formation along the Potomac River. At the end of a century of wear, these sandstone pillars had so crumbled, flaked, and some of them actually cracked, as to threaten the destruction of that side of the building covering the great money vaults of the government. They were consequently replaced with an equal number of granite columns. The point is that the original granite pillars appear as perfect today as when they were first erected; they cannot be told by any but an expert from the new granite pillars which have replaced the sandstone pillars, and it is believed by architects that under prevailing conditions all the pillars of the treasury building will be as solid and effective 10,000 years hence as they are today, should the treasury building and the Republic endure for such a period.

Of course, there is no hewn granite in existence known to be 10,000 years old, but there are granite edifices made by man more than 3,000 years ago which are today in an apparently perfect state of preservation.

The interesting feature has developed in modern stone-construction work, that old-fashioned hand hewing is sometimes better than machine work. This is shown in the huge granite columns which adorn the Cathedral of St. John the Divine, in New York City. It was proposed that these should be the greatest of granite monoliths—one-piece pillars—eight of them, each 54 ft. in height and 6 ft. in diameter. They were accordingly quarried in the rough from the Fox Island quarries, Maine, and prepared for finishing in a gigantic lathe. The first pillar was adjusted in the lathe and successfully turned down to the desired dimensions.

"What a grand thing a lathe is," said the foreman as he surveyed the massive pillar, ground down to a nicety. "We would have worked a dozen men for days with hand tools on this."

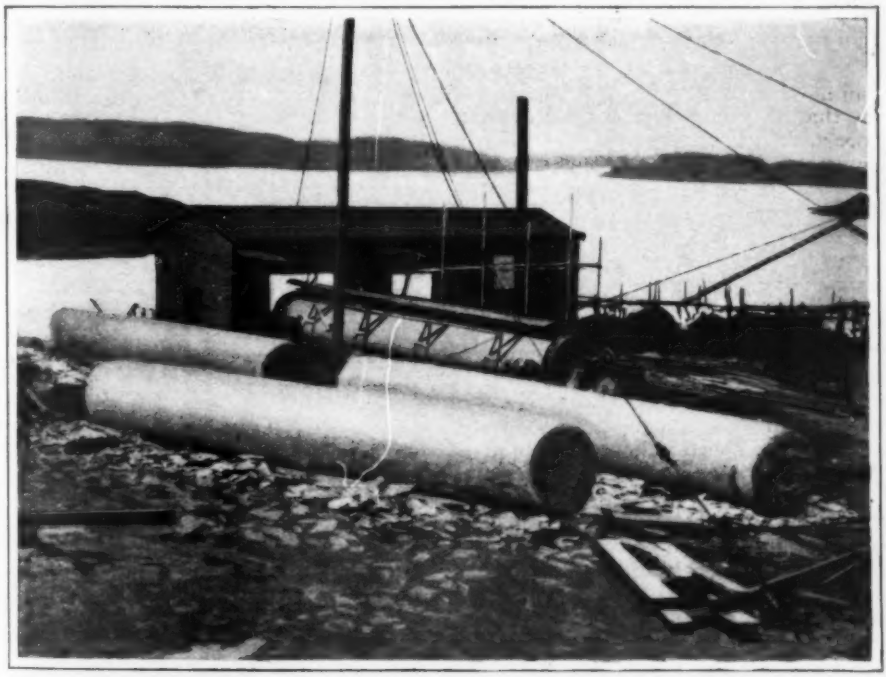
But when the workmen returned in the morning, they found the dressed pillar split transversely and ruined. A second pillar was turned and likewise carefully removed from the lathe. During the night the watchman heard a loud cracking and bursting noise, and upon examination found that the second pillar had split.

"H'm!" remarked the foreman, in the morning, "lathes are not so much after all."

It was concluded that the enormous size and weight of the columns, held in the lathe at only two pivotal points, constituted too great a strain upon the stone molecules, resulting in the practical destruction of the columns, even after the job of turning had been completed and the strain relaxed. It was therefore deemed necessary to cut the monoliths in two pieces before placing them in the lathe. Had the columns been dressed down by hand, as would have been done 100 years ago, there would have been no question of their cracking; on the other hand, the cost of the work would have been greatly increased.

¶A 917-ft. wireless tower with an estimated radius of 6,000 miles is being erected at Nauen, Germany, to replace the one which was blown down there about a year ago.

Replacing the Sandstone Columns of the U. S. Treasury with Granite That will Last 10,000 Years



Giant Granite Monoliths, 54 Ft. Long and 6 Ft. Thick, That Cracked When Turned in a Lathe

CAB WITH THREE WHEELS USED THIRTY YEARS

This three-wheeled cab was designed about 30 years ago by a veteran cabman of London and has been in continuous use by him since that time. The inventor claims that the vehicle cannot be and never has been overturned.

Three-Wheeled Cab Used in London for Thirty Years

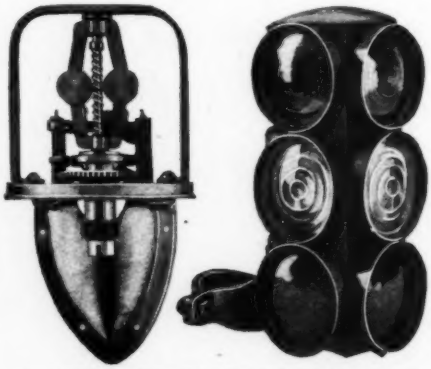
A "SHAKING DOWN" METHOD OF CONCRETE PAVING

A new method of constructing concrete pavement, in which the concrete mixture is "shaken down" by means of a vibrator, has been adopted with success in several Texas cities. The purpose of the "shaking down" is to force surfacing material into the body of the concrete, thus producing a dense mass.

The subgrade is prepared as for any other pavement, and then the concrete is mixed and spread, as much water being used as the mass will retain without draining. After the spreading has advanced a few feet, a coating of crushed granite is applied and the surface is ready for the vibration treatment. Platforms, 20 in. wide and as long as desired, made up of ⅝ by 4-in. strips, are then laid to support the vibrator, which is mounted on rollers. The vibration causes the crushed granite to sink in.

SPEED-INDICATING LAMPS FOR AUTOMOBILES

Mention was recently made in this magazine that the chief of police of Los Angeles was attempting to have an ordinance passed to compel the installation of speed-indicating lamps on all automobiles. The device which the chief is advocating is here shown. In a brass case, designed to be placed on the radiator, are mounted two sets of bull's-eyes, each set comprising a red, a white, and a green light. The mechanism which automatically switches the different lights off and on, according to the speed of the car, is



The Speed-Indicating Lamps and the Mechanism Which Operates Them Automatically

connected with a speedometer shaft. The white light shows when the car is making a speed of 10 miles or less; the green light, at speeds of over 10 and under 20 miles, and the red light is displayed when the car makes more than 20 miles.

ADMISSION OF MOTOR CARS TO NATIONAL PARKS

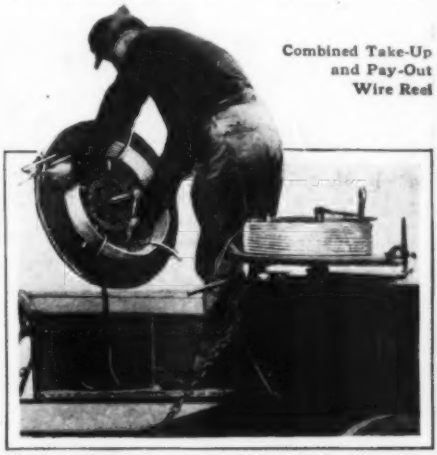
Automobiles are admitted, under appropriate regulations, to the following national parks: Mt. Rainier, Wash.; Glacier, Mont.; Crater Lake, Ore.; General Grant, Cal.; Wind Cave, S. D., and the Platt National Park, Okla. They are not admitted in the Yellowstone, the Yosemite, or the Sequoia National Parks. The question of admitting motor cars into the Yosemite Park is now under consideration by the Federal authorities.

HYDRO-AEROPLANE CARRIES SIX PERSONS

The new hydro-aeroplane constructed for Baron Deutsch de La Meurthe, the well-known French sportsman who was one of the first patrons of aerial navigation, is spoken of as a hydro-aerobus, because it easily and comfortably carries six persons in the cockpit of the boat portion.

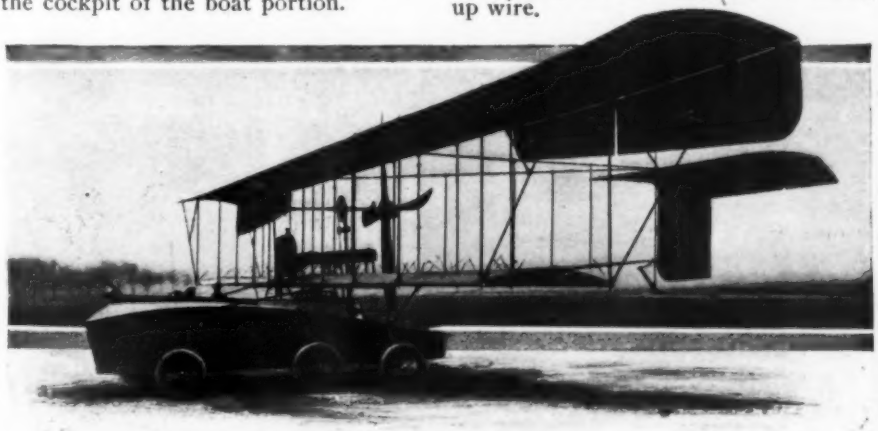
REEL THAT TAKES UP AND PAYS OUT WIRE

The combined take-up and pay-out wire reel here shown is made from sheet steel and has an adjustable wire



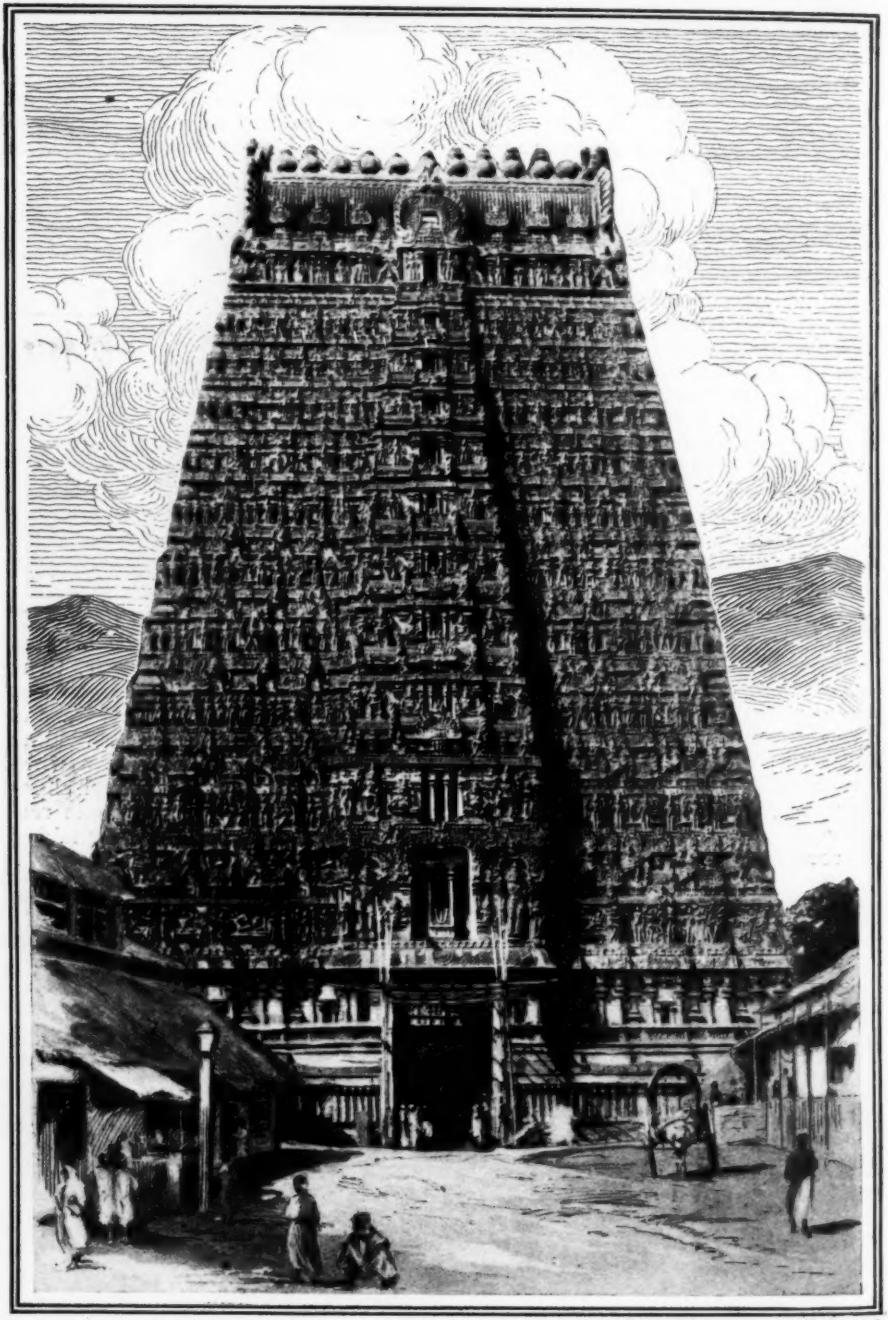
Combined Take-Up and Pay-Out Wire Reel

guide and arms that can be adapted for different-sized coils of wire. The reel has no rims or spokes to cut through the insulation of the wire, and it is provided with a brake for holding the wire at any desired tension without slipping. This type of reel eliminates the necessity of using one reel for paying out and another for taking up wire.



The Six-Passenger Flying Boat Owned by Baron Deutsch de La Meurthe

A PRIMITIVE SKYSCRAPER THAT RIVALS IN BEAUTY



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This Twelve-Story Hindu Temple at Kumbhakonam, India, was Built Many Centuries Ago by a Bayak King

THE LATEST SPLENDID TRIUMPH OF ARCHITECTURE

Copyright, Underwood & Underwood
The Fifty-Five-Story Woolworth Building Soars in Cathedral-Like Beauty beside New York's City Hall Park

NEGLECTED MONUMENT TO GREAT EXPLORER

Overgrown with small palms and other tropical vegetation is the monument to Magellan, on the Island of

Monument to Magellan, in the Philippines, Which has become Overgrown with Vegetation

Mata in the Philippines, where he was killed in 1521 by the hostile natives. The monument was erected many years ago on the spot where he was slain, but the island is not much visited, and the monument, especially in the years since American occupation of the islands, has become much in need of repair.

¶An arrangement has been devised by means of which mail bags and other packages may be picked up from the ground by an aeroplane in full flight.

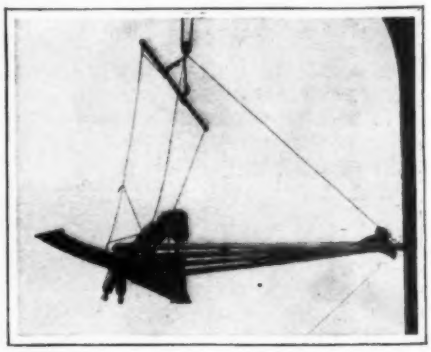
ATLANTIC TO PACIFIC BY TELEPHONE

Before the end of 1913 it will be possible to telephone between the Atlantic and Pacific Coasts and another line connecting these two points will be completed before the Panama-Pacific exposition of San Francisco opens in 1915, according to officials of the American Telegraph and Telephone Co. One route will be via Omaha, Denver and Salt Lake City to Los Angeles, and the other via Omaha, Julesburg and Cheyenne to San Francisco.

At present the longest telephone line in the world is between New York, or Boston, and Denver. The distance from New York to the Pacific Coast by telephone will be approximately 3,300 miles and the cost of conversation is expected to be about $18 per minute.

PARACHUTE-TESTING DEVICE

This method for testing a parachute without a human being accompanying it, consists in folding up the parachute and fastening it to a dummy which is then placed on a framework suspended by block and tackle from some high structure. When a rope attached to this framework is pulled, the framework is tipped and the dummy is thrown into the air with the parachute.



Testing Parachutes with a Dummy Instead of a Human Being

A Bear That is More or Less Familiar with Motorcycle "Joy Riding"

BEAR AS MOTORCYCLE COMPANION

It would be dangerous to allow this bear to usurp the operator's seat, were the motorcycle in actual operation, but the animal appears very much at home with its fore paws on the handlebars and its hind paws on the pedals. This is due to the fact that this pet bear has had many motorcycle rides as a passenger.

CARS FOR DISINFECTING THE CLOTHING

Railroad cars containing apparatus for disinfecting the clothing and baggage of passengers who have been exposed to contagious diseases, have been put into service on a railway line in Italy. Each car is fully equipped with two sets of disinfecting apparatus; one being a steam-stove system, and the other designed to disinfect the clothing by means of formalin. Two cars are already in operation and several others are in course of construction for use in the southern part of the country.

GREENHEART WOOD USED FOR PANAMA CANAL LOCKS

The sills and fenders of the Panama Canal locks are made of British Guiana greenheart, a wood which, according to the Department of Agriculture, outlasts iron and steel when placed in water. It is used in ship and dock building, trestles, bridges, shipping platforms, flooring, and for all purposes involving great wear and tear. The woods of two species of West African trees have been introduced into British markets as substitutes for greenheart under the name of African greenheart, but both are inferior to the South American tree.

All the gates, piers, and jetties of the Liverpool docks and practically all the lock gates of the Bridgewater Canal in England are of greenheart. It furnished the material also for the 50 pairs of lock gates in the Manchester Ship Canal. When the greenheart dock gates in the Mersey Harbor at Liverpool were removed in order that the channel might be deepened and widened, the same wood was again employed in building the enlarged

gates, and wood placed in the gates of the Canada dock, in 1856, was used again in its reconstruction, in 1894. Nansen's ship, the "Fram," and the antarctic ship "Discovery" were built of greenheart. In addition to its use as timber, great quantities of the wood are made into charcoal.

Though it grows in parts of British, French, and Dutch Guiana, Venezuela, Brazil, Colombia, Peru, Trinidad, Jamaica, and Santo Domingo, it is being cut only in British Guiana, where it is found along the seacoast and watercourses, seldom extending more than 50 miles inland. Greenheart once brought $1 per cubic foot at the point of shipment, but the present price is considerably less. Constant drain for more than 100 years upon the most accessible stands of greenheart in British Guiana has stripped the forest of its best material, and the wood now obtained is of inferior quality. Tracts are now being cut over in some places for the third time. Only the heartwood of the tree possesses the peculiar durability desired, and the best wood is found in old trees.

The wood of three other species of the same botanical family is occasionally cut and sold with the genuine greenheart. These are the white cirouballi or sirauballi, the yellow cirouballi, sometimes called "black cedar," and the keritee or kretti.

"MAINE'S" TURRET AND GUNS ARE MONUMENT'S BASE

The government of Cuba intends to perpetuate the memory of the battleship "Maine" by the erection of a monument in Havana. The chief feature of the monument will be the port after turret and guns of the "Maine," recovered from the wreck last year when it was raised from the bottom of Havana Harbor. The design for the monument submitted by Señor Emilio Heredia has been approved by the government of Cuba, and is shown in the accompanying photograph.

The monument will be placed in a park just west of the Santa Clara battery, at the entrance to Vedado, a suburb of Havana. The sculptor has sought to represent the birth of the Republic of Cuba amid the smoke and flame accompanying the destruction of the famous battleship. The figure of a woman is seen rising out of the smoke above the turret and guns which form the base of the monument. The figure will be in marble, while the turret itself will rest on a stone base. The monument will be 27 ft. in height and will be surrounded by a fence made of anchor chains taken from the wreck of the "Maine."

A bronze tablet will be attached to the face of the turret, under its guns. This tablet will bear the text of the joint resolution passed by the United States Congress which declared Cuba's inde-

Cuba's Memorial to the "Maine" Shows Sculptured Smoke Arising from the Battleship's Turret

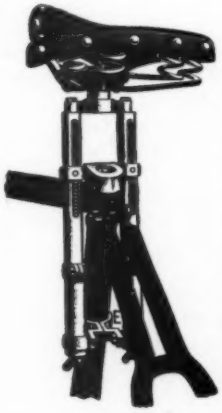
pendence and which was tantamount to a declaration of war with Spain. Five other tablets will be placed on the sides of the turrets. These will represent, in bas-relief, the arrival of the "Maine" in Havana Harbor, its destruction, the wreck as it appeared in the harbor, the work done to raise the "Maine," and finally, the burial of the hulk on March 16, 1912.

TROLLEY CAR AND AUTO ACCIDENTS

One human being is injured every 12,053 miles traveled by a trolley car and one for every 178,666 miles covered by a motor car, but before a fatal accident occurs the trolley travels 800,000 miles and the automobile 2,400,000 miles. These figures apply to employes and occupants only, it being necessary for the automobile to travel three times as far as the trolley before killing an outsider, and about seven times as far before injuring one.

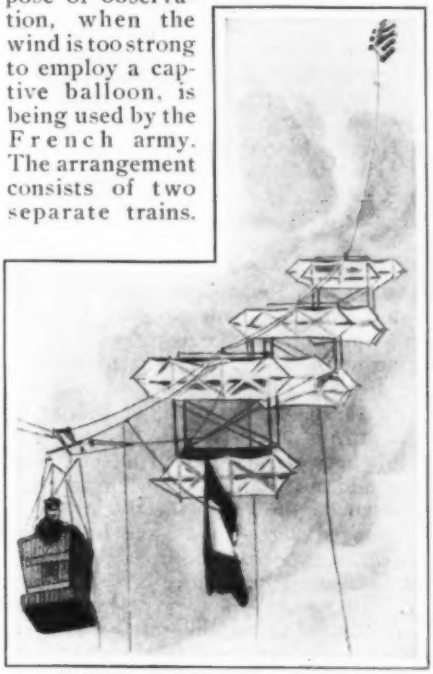
ELASTIC SADDLE FOR MOTORCYCLES

An improved saddle for bicycles and motorcycles, in addition to having the ordinary form of spiral spring support beneath the seat, is also provided with two adjustable spring coils so mounted within the two upright rods that their tension may be increased or lessened at will by simply turning the thumbscrews attached to the lower ends of the rods. The saddle can also be raised or lowered by loosening the clamps above the thumbscrews, and the two supporting rods give perfect rigidity to the seat at all times.



KITE TRAIN USED BY FRENCH ARMY

A new form of kite or kite train which lifts a man in a balloon basket to a considerable height for the purpose of observation, when the wind is too strong to employ a captive balloon, is being used by the French army. The arrangement consists of two separate trains.



Observing the Enemy from a Kite Train

The first carries and stretches the cable on which the other—the towing train—pulls up the basket. The entire system uses as many as eight different kites, each of these being made of several surfaces, on the box-kite principle, the total surface of the kites being about 1,000 sq. ft. An automobile is used to convey the cable drum and draw a second vehicle which contains the kite apparatus.

¶More than 3 hp. of electricity is being used by the contractors to every man at work in constructing the Lexington Avenue and Broadway tunnels in New York City. The current is used to operate all apparatus requiring more than manual power.

ARMORED AEROPLANES FOR U. S. ARMY FLIERS

Armored aeroplanes, providing for the protection of the airman, pilot and engine, are demanded in the latest specifications for flying machines issued by the War Department. A special design for the armored cover has not been drawn by the department, the design being left to the ingenuity of the manufacturers. It is specified, however, that the finest chrome steel shall be used and that the armor shall be about .075 in. thick. Tests made by the Ordnance Bureau show that chrome steel .06 in. thick will withstand the steel-pointed bullet used in the regular army rifle at a distance of 2,000 ft. The missile, striking the armor squarely, will produce a deep dent but will not penetrate. To make an armored cover sufficient to protect the airman, pilot and engine will require 15 sq. ft., or more, of this thin, but strong steel. The armor will weigh between 35 and 50 lb. and will thus add no material burden to that imposed on the aeroplane.

Armored aeroplanes have been the subject of experiment abroad, but have not been used heretofore in this country. In some types of machine the guides running to the tail or rudder have been covered by fabric which, at a distance, gives the same appearance as armor. However, the armored car will not only carry side armor, but, of more importance, bottom armor and two upper hoods to protect the engine.

Three aeroplanes will be bought shortly under the new specification, which aside from the question of armor, includes many new requirements. The length of flight carrying a live load of 450 lb. has been doubled; heretofore the test flight was only two hours and could be made largely over an aviation field; the new test requires four hours' continuous flight, which must cover a minimum distance of 180 miles and be made over a course designated by the examining board. Only the end of the flight may be conducted over an aviation field. The purpose of this requirement is to ascertain the power of the machine under actual service conditions. Flight over a smooth and protected field does not always demonstrate what a machine will do when flying over trees, hills, towns or water. The eagerness of the Signal Corps to obtain a machine which will still be useful, even when one of its drivers is disabled, when rough ground is encountered, or when the engine is put out of commission, is quite apparent.

Without saying so, in so many words, the War Department is driving at a standard form of control and in the new specifications has gone so far as to say, "The system of control must be of a pattern approved by the board of officers conducting the tests." A standard and, as near as possible, uniform control is desirable for the same reason that standard forms of weapons are desirable—the enlisted man and officer will not be confronted by a strange device in time of need.

Besides wireless apparatus each machine shall carry the following equipment: a tachometer, a compass, one aneroid barometer, a barograph, a map holder, pad and pencil holder, a clock and an indicator for measuring angles of incidence.

The wireless apparatus will be provided by the Signal Corps itself, but manufacturers bidding on aeroplanes will be furnished with necessary plans so that they may provide a place for the installation of this apparatus.

The generator will be attached to the aeroplane engine. The antenna, instead of being sent up into the air as from a ground station, will drop from the base of the aeroplane, swinging in the air. It will be kept on a reel and may be released or wound up again by the airman while in flight by pressing a foot mechanism. The wireless apparatus will add about 75 lb. to the weight of the machine.

¶A $3,000,000 rubber company has been organized and is erecting a large automobile-tire factory in Brazil.

QUEER HOUSE BUILT IN ONE DAY

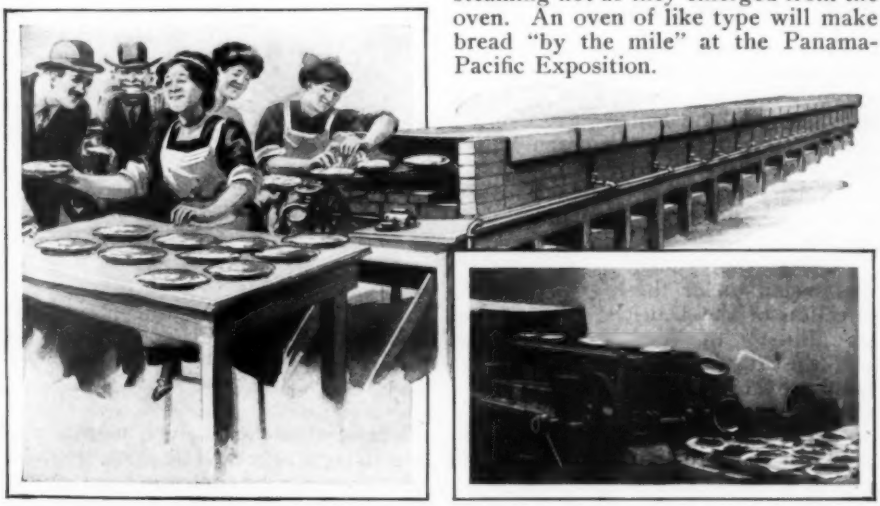
The accompanying picture represents probably one of the oddest-shaped dwellings in Illinois. More than that, its construction was accomplished in a very unusual way. It was hauled 16 miles in a buggy and was put up between the hours of two o'clock Sunday morning and midnight following. The building is formed of odds and ends found in a carpenter shop, which were hauled to their present location and there put together. The queer-looking building stands on a concrete foundation.

Built of Odds and Ends

¶Over 600,000 lb. of fish were caught during one trip by fishermen near Beaufort, N. C.

OVEN BAKES MORE THAN TWO THOUSAND PIES AN HOUR

An oven 75 ft. long and turning out 2,225 apple pies an hour, which were served free to the public, was the sensation of the National Apple Show and Jubilee Carnival recently held in Spokane. The apples were first made into sauce in a gigantic sheet-steel kettle, 18 ft. high and 10 ft. in diameter, 500 bu. being cooked at a time. From the kettle the sauce was passed between the crusts and onto an endless chain which took the pies through the oven, the cooking journey lasting 1½ minutes. The pies, which were about 3 in. in diameter, were served to the public steaming hot as they emerged from the oven. An oven of like type will make bread "by the mile" at the Panama-Pacific Exposition.



A Monster Oven Which Baked 2,225 Apple Pies an Hour for Free Distribution to the Public Attending Spokane's Apple Show

FLOATING STORE OF MOTOR-BOAT SUPPLIES

A new departure in motorboats is here shown. This boat is practically a floating store or salesroom of gas-

Motorboat Store with Engine Supplies

engine supplies, as it carries almost everything that may be needed by other boats in cases of emergency, or when the regular source of supply on land cannot be reached without difficulty. The supply boat travels constantly over Puget Sound from Olympia to the Cape and is regarded as one of the most useful boats plying on that water.

CONCRETE FIFTY YEARS IN THE OCEAN

That concrete remains entirely intact, after having been more than half a century in sea water, is a fact that has been established by recovering several blocks from the ocean where they have lain since 1858, when three seaport docks in Denmark were constructed of Portland cement.

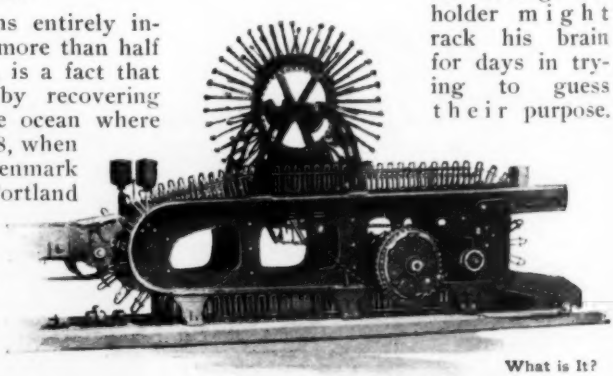
One of the blocks was tested under the direction of the Danish Minister of War and the result indicated that the sea-water apparently had no effect whatever upon the specimen analyzed. The block, to which is attached the report of the test, is on exhibition at the German Museum of Nature in Munich.

PARACHUTE TRIALS FROM THE EIFFEL TOWER

Since the fatal drop, some time ago, of an inventor who attempted to demonstrate the practicability of his parachute for airmen by jumping with it from the Eiffel tower, the French government has prohibited further experiments of like nature. Tests of such devices, however, can still be made from the tower, providing a weight be substituted for the human body, and a recent test, so conducted, proved successful. The parachute in question, opening out to a diameter of 40 ft., is spread by a system of springs operating automatically the moment the fall begins. In the trial the apparatus opened fully before it had fallen 60 ft.

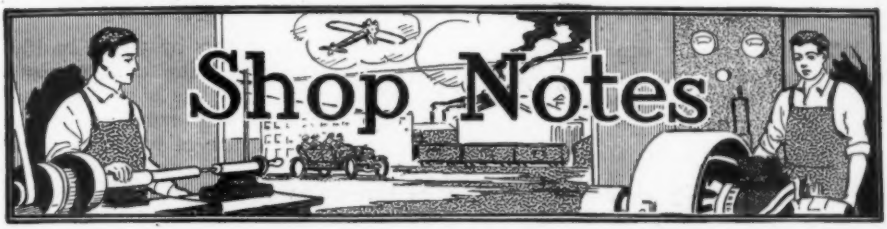
AN INHOSPITABLE-APPEARING MACHINE

There are a number of machines so extraordinary or "queer" in shape that the average beholder might rack his brain for days in trying to guess their purpose.



What is It?

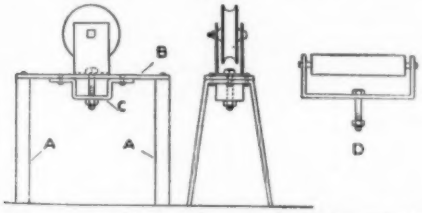
Here is a machine which might, were we living in the middle ages, be easily mistaken for an instrument of human torture, but its reason for being is a production we see every day.



Shop Horse with Roller Attachments

The shop horse is a necessary appliance and its use can be greatly increased if it is supplied with a set of combination rollers. It is best to build these horses complete, as all parts will then be proportioned correctly to receive the roller supports.

The posts A, A, are shaped from wrought iron, 47 in. long, 2½ in. wide and ⅝ in. thick, the part on which the top plate B rests being 7 in. long, so that each post is 20 in. in length. The top plate is 20 in. long, 6 in. wide and ⅝ in. thick. The bracket C is formed as shown from a piece of metal 22½ in. long, 4 in. wide and ¼ in. thick,



Shop Horse with Interchangeable Attachments for Handling All Kinds of Round and Plate Stock

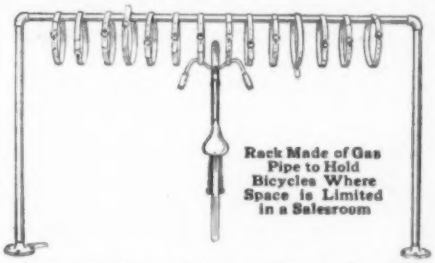
making the two vertical parts 9 in. long.

A grooved metal pulley, 8 in. in diameter, is fitted in a yoke which is attached to the horse with a bolt as shown. A roller, D, 2 in. in diameter and 15 in. long, also fitted in a yoke, may be attached to the horse in the same manner as the pulley.

The grooved pulley is used for round iron, rods and shafting, while the roller is adapted for holding plates, channels and angle iron. The attachments can be quickly changed or removed entirely and the horse used in the ordinary manner.

A Rack for Bicycles

One retail firm uses a very practical device for storing bicycles. It consists of a frame built up of 1-in. gas

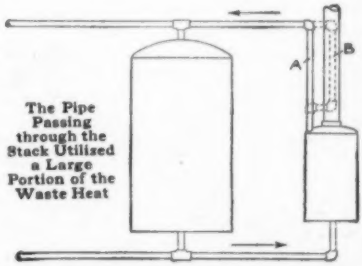


Rack Made of Gas Pipe to Hold Bicycles Where Space is Limited in a Salesroom

pipe, two floor plates and two els. The height of the frame is 42 in. and the width 6 ft. Skate straps are used for attaching the handlebar to the rack.

Utilizing Waste Heat in a Gas Water Heater

The changing of an outlet pipe from A to B, as shown in the sketch, from a large gas-heated boiler resulted in quite a saving of fuel. The burned gases and heat passing out through the heat pipe

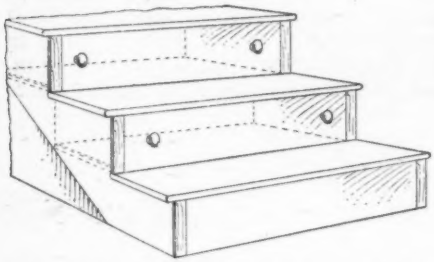


The Pipe Passing through the Stack Utilized a Large Portion of the Waste Heat

or stack aided considerably in heating the water.—Contributed by John F. Hurst, Louisville, Ky.

Drawers in Stair Steps

Where space is limited in the modern bungalow or cottage having second-floor rooms, drawers may be



Each Step on a Stairway may Contain a Drawer in Which Many Articles can be Stored

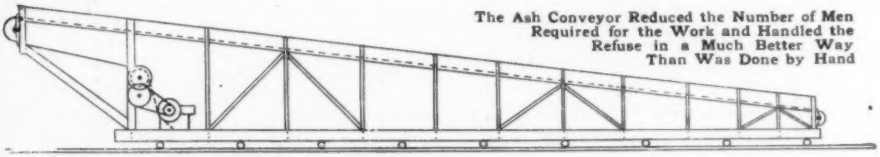
constructed to enter the riser on each step and used to store many articles not in everyday use. The drawers should be snugly fitted in the openings to keep out the dust. After using the drawers, care should be taken to close them again.—Contributed by Fred L. King, Islip, N. Y.

A Portable Chain Conveyor

The conveyor shown in the illustration was used to remove ashes from the slab pit of a sawmill, and saved its cost many times. Its length is 64 ft., with a height of 30 in. at the receiving end, and 14 ft. at the delivery end.

Old boiler tubes were cut the right length and used for rolls under the conveyor to insure easy and smooth motion. A 3-hp. engine was used at the high end for propelling the chain. The parts consist of 2 by 4, 2 by 6 and 2 by 8-in. material.

The lower end of the conveyor was kept close to the ash pile to make the shoveling easy. The other end delivered the ashes to the dump wagons.—Contributed by J. W. Shannon.

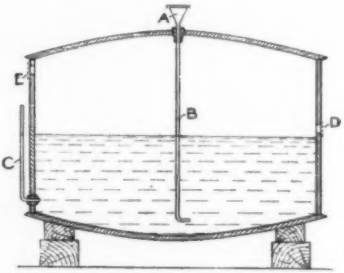


The Ash Conveyor Reduced the Number of Men Required for the Work and Handled the Refuse in a Much Better Way Than Was Done by Hand

To Make Grape Vinegar

A simple apparatus by which moldy grapes or spoiled wine can be converted into vinegar has been designed by experts of the Department of Agriculture. By the use of this apparatus waste grapes, which otherwise would be thrown away, can be made into an excellent vinegar. For preparing grape vinegar on a small scale the first thing necessary is a comparatively clean room where an average temperature of 70 deg. F. can be obtained. The parts needed for the apparatus are a cask of about 50 gal. capacity, a wooden spigot, a thermometer, a long-stem glass funnel, and a glass tube. If smaller quantities of vinegar are to be prepared, barrels of 10 gal. capacity can be utilized.

The cask selected should be arranged



Section of the Cask and Its Attachments Which are Used for Converting Grape Wine into Vinegar

and fitted up with the appliances shown in the sketch. The glass funnel A is placed in the cask with the long stem B almost touching the bottom, the tube being bent at its lower end as shown. In the left head of the cask a hole is bored for the purpose of inserting a cork holding a glass tube, C, which is also bent at right angles at its lower end and serves as a gauge to determine the level of the vinegar or

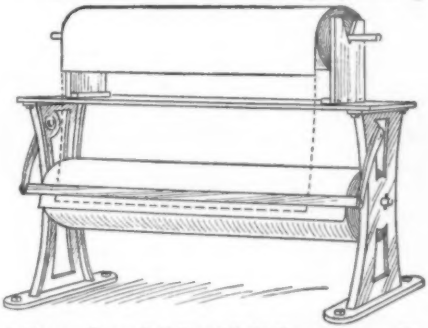
fluid in the cask. The tube and cork may be removed at the end of the vinegar-making process and replaced by a wooden spigot for drawing off the finished product. Holes for ventilation, which may be stoppered, are bored in the ends of the cask, one at D, just above the center of the right end, and another at E, near the top of the head which contains the tube C. These holes are covered with pieces of varnished metal netting to prevent the entrance of vinegar flies.

The manufacture of vinegar from grapes has two stages: First, the alcoholic fermentation, by which the sugar is changed into alcohol and carbonic-acid gas; second, the acetic fermentation, in which the alcohol is changed into acetic acid.

After arranging the cask on blocks, as shown in the illustration, from 2 to 3 gal. of good vinegar is placed in the cask through the funnel A. This amount represents 10 per cent of the wine to be fermented. All the grape juice must first be converted into wine and then heated to 85 or 90 deg. F. It is poured into the cask in quantities of one-fourth or one-third of the total amount to be fermented at intervals of one week; that is, if 30 gal. are to be fermented and the additions are to be made by thirds, 10 gal. are poured in first, 10 gal. the second week, and the final 10 gal. the third week. The last addition of wine must fill the cask almost to the level of the ventilator E. Thereupon the wine-vinegar mixture must remain at perfect rest, otherwise the acetic-acid bacteria which produce the vinegar will sink to the bottom and become inert, as far as vinegar production is concerned. When the wine has been converted into vinegar, it is drawn off through a spigot placed in the opening previously holding the gauge glass C. The process takes anywhere from one to three months, depending entirely on the temperature, which at no time should be over 93 deg. F.; the supply of air admitted through the ventilators D and E, and the quantity of alcohol in the wine.—Contributed by Wm. P. Kennedy.

Wrapping-Paper Stand

The shipping department of a large department store had to be increased to take care of the rapidly growing

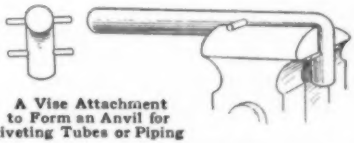


A Narrow Paper-Roll Stand Built Temporarily on Top of the Regular Stand

trade, and instead of waiting for small-sized wrapping-paper reels these were constructed on top of the ordinary reel in the manner shown in the illustration. Two pieces, or standards, with V-shaped notches on their upper ends were toe-nailed to the top crosspiece on the reel frame and a piece of old broom handle used for an axle. The end of the narrower paper was passed under the cutter on top of the wider paper.—Contributed by Geo. P. Kuch, Sidney, Ohio.

Vise Anvil for Riveting Tubes

For riveting on the inside of a piece of pipe or tubing the fixture illustrated is excellent. It consists of a short bar of round steel with a short right-angle bend at one end. Two holes are drilled and pins are driven in crossways. This piece is put in a vise with one pin on top of the jaws and one beneath. It is

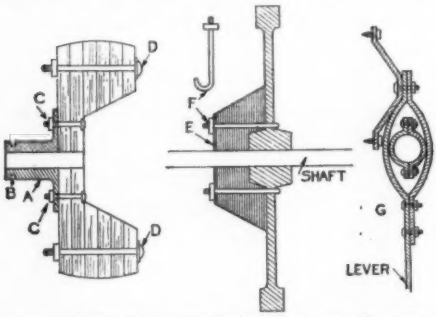


A Vise Attachment to Form an Anvil for Riveting Tubes or Piping

obvious that if a tube or pipe is slipped over the free end a solid anvil is secured on which to do riveting.

Homemade Friction-Clutch Pulley

A friction-clutch pulley can be constructed from material usually found about most shops. The one shown



Homemade Friction-Clutch Pulley Used on a Gasoline Engine to Start and Stop the Line Shaft

was made of parts described as follows: The piece A is a part of an old lawn-mower wheel, which had the rim cut off and a groove, B, ½ in. wide and ⅜ in. deep, turned in the hub. The flange was drilled for four ⅜-in. carriage bolts, C, which hold the two first circular pieces of hardwood to the piece A. These pieces should be placed so that the grain of the wood will be crossed. The pulley is further built up of circular pieces or segments of wood to the desired thickness, always crossing the grains in laying each layer. The subsequent layers are fastened with bolts D. The built-up part is then turned in a lathe in the form shown.

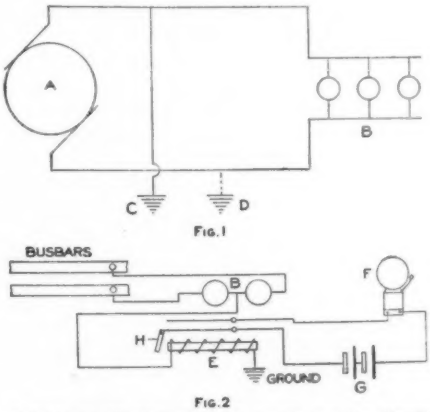
The cone part is built up of fiber and, when completed, should be of such size and shape as to fit the turned part in the pulley, the sloping surface being a trifle larger so that the cone will grip the surface before it reaches the bottom of the hole. The fiber is clamped to the flywheel, or other wheel, with a metal disk, E, and bolts, F. A split collar and yoke, which fits into the groove B, was made as shown at G, and with it the pulley can be set into or thrown out of motion.—Contributed by C. W. Bahrke, Lebanon, Ore.

¶Coin bags used by banks make excellent bags for carrying automobile-tire inner tubes.

Alarm Ground Detector

In the operation of an electrical generating station, considerable trouble is often experienced due to the system becoming grounded. One ground will, as a rule, produce no serious trouble, but it is always advisable to keep the systems as clear of grounds as possible in order to prevent the damage that is likely to result if the system becomes grounded on both sides of the generator. As an example: If the generator A, Fig. 1, is operating a number of lamps, B, no difficulty will be experienced or trouble result so long as there is only one ground, C. A second ground, D, shown by the dotted lines, will produce either a partial or dead short on the line, depending upon the resistance of the two ground connections, C and D, and it is obvious that the trouble resulting from two such grounds would be of a rather serious nature if the ground connections be of low resistance.

A great many generating stations are equipped with what is termed a ground detector, and it is necessary for the station attendant to operate a contact key or switch, that controls this instru-



A System with Two Grounds on It, and the Circuit of an Audible Ground Detector

ment, in order to test the system for grounds. The following simple device has the decided advantage of giving an audible signal the instant the ground comes on the system.

This ground detector may be constructed at a very small expense as follows: A diagram of the connections is shown in Fig. 2. An even number of incandescent lamps, of equal voltage and candlepower, are connected in series between the busbars of the switchboard. Only two lamps are shown in Fig. 2 and that is all there would be needed on a 110-volt circuit. If the voltage between the busbars is higher than 110 volts, more lamps should be used. A high-resistance relay, E, is connected from the center of the group of lamps to ground. This relay controls a circuit composed of an ordinary vibrating bell, F, and a battery of several cells, G.

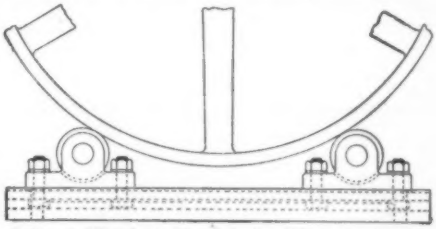
If the busbars are free from grounds, there will be no current in the relay winding, and since the springs, which its armature, H, controls, are normally out of contact, the bell circuit will be open. When, however, one of the busbars becomes grounded, there will be a current established in the winding of the relay; its armature will draw up and cause the two springs to come into contact with each other, and, as a result, the bell will be operated, thus immediately notifying the attendant that there is a ground on the system.

The higher the resistance of the relay, the more sensitive the signal will be, just as in measuring insulation resistance with a series voltmeter. A relay that will serve the purpose very well may be procured from almost any telephone company for less, perhaps, than it would cost to make one.

Rollers for Handling Large Cylindrical Work

These adjustable rollers were designed for use in connection with drill presses, and serve the same purpose on large work as the V-block on small work, the advantage being that the work rests on two rollers which rotate with the pulley or whatever is being drilled.

The device consists of a plate with T-slots into which the bolts holding the roller bearing may be moved or adjusted to fit the work in hand. When the work on the rolls is set centrally with the drill it is only necessary



Rolls on Which to Revolve the Work for Drilling Holes Centrally or on a Radial Line

to revolve the wheel or cylinder to the locations for the drill holes.—Contributed by F. H. Mayoh, Pawtucket, R. I.

To Prevent Machine Parts from Being Tarnished by Sulphur

A way to prevent brass machine parts from tarnishing when sulphur is used in the building is to paint them with naphtha or heavy oil. This can be removed with hot water and the brass polished with a dry cloth. This treatment is also good for the lighting fixtures in a home, while being fumigated, as it insures against damage by the acid fumes.—Contributed by Loren Ward, Des Moines, Iowa.

Nonsplashing Bucket Attachment

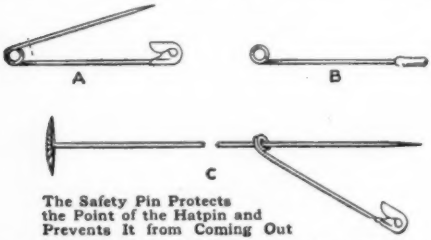
A partly filled shop bucket will splash over when any liquid is added, especially if heavier liquids are poured in quickly. This may be prevented by attaching two or more strips of sheet metal in the top of the bucket in a sloping position similar to a window shutter. These strips may be attached with clips at the ends, as shown at

The Strips Allow the Liquid to Enter the Pail, but It cannot Splash over the Edge

A in the sketch. Any liquid poured on the strips will easily enter the bucket without splashing over the rim.

A Hatpin Protector

The protruding pointed end of a hatpin causes no little trouble for the wearer in crowded places as well as

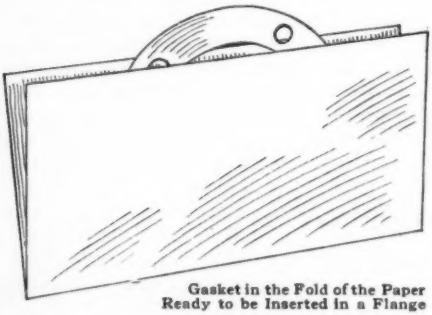


The Safety Pin Protects the Point of the Hatpin and Prevents It from Coming Out

a scratched face for anyone that may be near. The way in which one person avoided this difficulty is shown in the sketch. A safety pin was procured and the pointed end cut off on the dotted line as shown at A, whereupon the remaining part was bent as shown at B. The coiled end is slipped onto the hatpin, as shown at C, and the other end over the pin point in the manner of a regular safety pin.—Contributed by Alex. Mikulan, Seattle, Wash.

Inserting and Removing Gaskets

When inserting a gasket between flanges that cannot be separated to any great distance, it is always troublesome to get the gasket into position, says Power. To overcome this, fold a piece of stiff paper as shown in the sketch. The paper and gasket can be easily slipped in be-



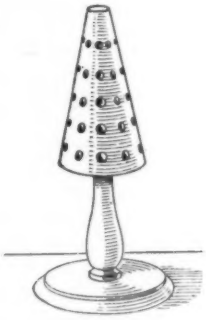
Gasket in the Fold of the Paper Ready to be Inserted in a Flange

tween the flanges and after one or two bolts are put in place the paper can be taken out.

To remove an old gasket when the flanges can be separated but very little is usually difficult unless a length of pipe is taken out. A simple way is to drive a cold chisel in the lower side of the joint sufficiently to loosen the flanges, and then run an old saw through the joint, sawing out the gasket. After sawing partly through, drive the chisel in the top of the joint to keep the flanges from pinching the saw and saw out the remainder of the gasket.

A Tool Holder

A very handy drill and nail-set holder can be made as shown in the illustration. The cone part is turned from a piece of hard wood and holes are bored to receive the tool shanks. The base may be constructed as desired.



The cone is made to revolve on an upright spindle, which may be the protruding part of a nail driven up through the bench top, or set in a base to make it portable.—Contributed by Lorenz Schneider, Jonesboro, Ark.

Gauntlets on Gloves

When the fingers or palms of gloves with gauntlets wear out, do not throw away the gloves, but cut off the gauntlets and procure a pair of gloves with short wrists to which the old gauntlets can be sewn after the wrist bands have been removed from the new gloves. The sewing may be done either by hand or on a machine, gathering in any fullness in the bellows of the cuff on the under side. A pair of gauntlets will outwear three or four pairs of gloves.—Contributed by Joseph H. Sanford, Pasadena, Cal.

Practical Telephony

By HAROLD HINTON

PART I

It is doubtless true that few people stop to realize what great strides have been made in perfecting the telephone. Nearly all of the present generation can remember when the old "magneto" phones were in use in every city and town where there were telephones; then came the time when the magneto phones were removed from the cities and relegated to the country villages and rural lines and their place was taken by the "common battery" phones. These phones have, in some localities, been replaced by the "automatic," and now we are entering the age of wireless telephony. Each system will be treated briefly in its turn beginning with the

Magneto Telephone

The magneto telephone set consists of a receiver, transmitter, hand generator or magneto, battery, induction coil, cut-out and switch. These pieces of apparatus are arranged and connected, as shown in Fig. 1, so that by leaving the receiver on the hook and turning the crank of the magneto a drop is released in the exchange to attract the attention of the operator who cuts in, inquires what, or who, is wanted, plugs in the line and rings the party which was called. The circuit showing both phones connected through the switchboard will be seen in Fig. 2.

The line construction is about the same as is used for other telephone work, but the drop wires (the wires connecting the phone with the line wires) are connected up a little differently than in other and more advanced telephone work. The drop wires are connected up, as shown in Fig. 3, so that whenever any party on the entire line calls the exchange all of the bells ring; and when any party on the line is called by the central office all the other phones on that line ring. It is not uncommon for these magneto lines to have from 12 to 15 stations, and that is one of its greatest drawbacks, because the bells cannot be rung separately as they can on the common battery.

The magneto phone was an excellent

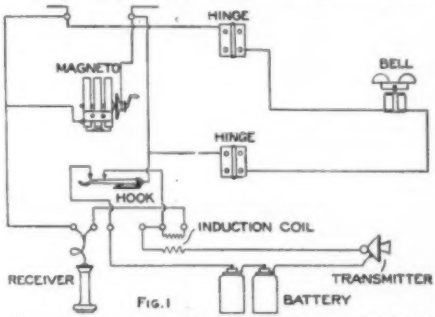


FIG. 1

Wiring Layout and Connections for the Old-Style Magneto Type of Telephone

piece of work until it was replaced by the common-battery system, and, it is still admired by those who must use that style of service or do without it entirely.

The phone itself is a very simple affair, the line work is comparatively simple, and the maintenance cost is low; in fact, the whole outfit is simplicity itself to those who have gone through the common-battery and automatic stages. The principal and most vital piece of apparatus in either the local or common-battery systems is the switchboard.

The switchboard is a device by means of which two lines may be connected together so that conversation

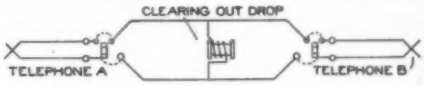


FIG. 2

Circuit Connecting Two Magneto Telephones through a Switchboard Where A is Calling B, or Vice Versa

may be held from one line to the other. A simple form of magneto switchboard is shown in Fig. 4. This style switchboard is still in use and is built in the shape of a cabinet, the face of which has a number of annunciator drops and

"jacks." The "jacks" are the openings into which the cord plugs are put, to

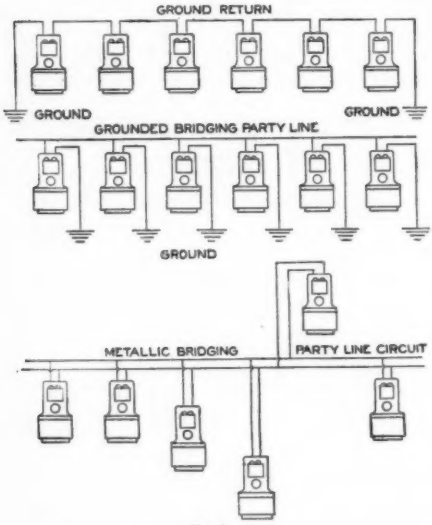


FIG. 3

Three Methods of Returns, Two Are Common Returns and the Other a Metallic for Magneto Telephones

make the answering connection when the call is made.

There are two principal kinds of line circuits; first, where one wire is run directly into the exchange and the other enters through a "ground" or a

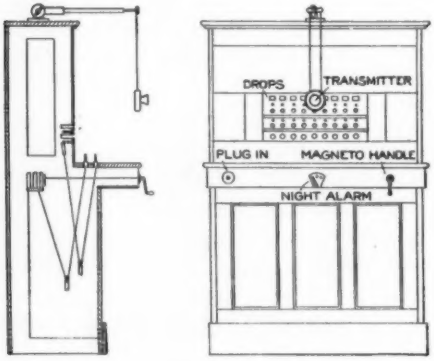


FIG. 4

A Magneto Switchboard, Carrying Drops for Connecting Any Two Lines of Magneto Telephones Together

"common return," as shown in Fig. 5; and second, where the two wires are run into the exchange, Fig. 6. This latter is what is termed a "metallic circuit" and, when properly constructed, is the only one which will assure the most efficient results.

Each magneto switchboard has six circuits as follows:

First—A line circuit must be provided for each line entering the exchange. The only apparatus in this circuit proper is a combined drop and jack, to the terminals of which the subscriber's line is led. The ringing current comes in through a jack and the winding of the drop. When the operator plugs in to answer a call, a contact is broken in the jack and the drop winding is cut out of the talking circuit.

Second—A night-alarm circuit is provided, there being only one such circuit on the entire switchboard. This is used whenever the operator is not directly in front of the board, as is

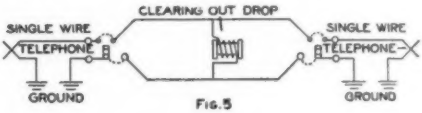


FIG. 5

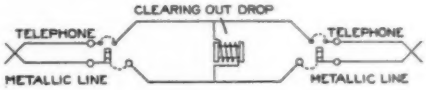


FIG. 6

The Two Principal Line Circuits, One a Ground Return and the Other Metallic

usually the case at night, and a call comes in which might not be noticed without it. The night-alarm contacts close when the shutter A, Fig. 7, falls and the alarm bell rings until the operator answers the call and restores the drop.

Third—A pilot circuit, of which there is usually one on each operator's position.

Fourth—The cord circuits, the number of these depending on the number of line circuits and the greatest number of connections likely to be up at one time.

Fifth—The operator's circuit, one of which is provided for each operator. These two circuits are shown in Fig.

8 and operate as follows: In the cord circuit is placed a ringing key, A; a listening key, B, and a ring-back key, C. A clearing-out drop (which is really a disconnect signal) is bridged across the two sides of the circuit. This drop does not shunt the voice currents to any great extent, but is readily thrown by the generator in ringing off. The keys A and C have platinum contacts and are the only apparatus through which the voice currents pass. The ringing keys A and C allow the operator to ring out on either cord at will. Each ringing key, when operated automatically, opens the cord circuit, so that no generator current passes back to ring in the operator's ear.

The operator's set consists of a head phone, D; a cut-in jack, E; an induction coil, F; a transmitter, G, and a battery, H.

Sixth—The generator circuit, one of which is provided for each operator.

When the magneto phone is to be used for farm or rural lines without any switchboard, that is, as shown in Fig. 3, it is best to use three or more cells of battery, according to the length and condition of the line. This material may be purchased very cheaply at present, and if the phones are connected up as in Fig. 1 and the line wires are carefully run, being sure that there are no grounds on the line, any group of

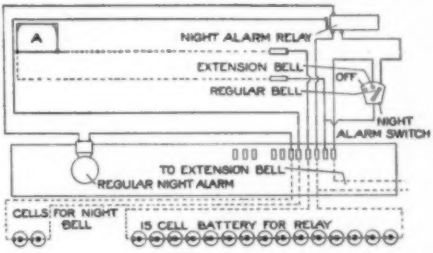


FIG. 7

Wiring Layout for a Night-Alarm Bell, to Ring When a Contact is Made as the Drop Falls

people may have a little telephone system of their own by having signals for calling each other. No. 12 galvanized

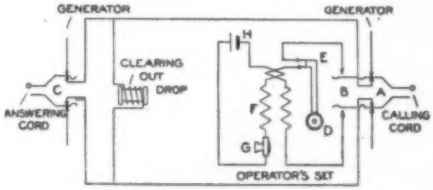


FIG. 8

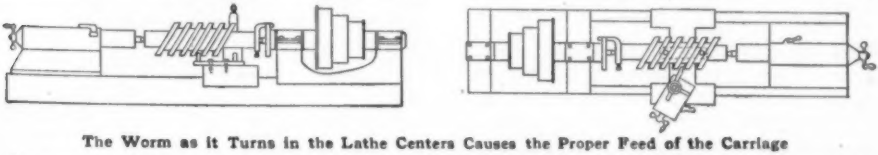
Wiring Diagram of a Circuit Used at the Office Switchboard by the Operator

iron wire is generally used, but copper is a better conductor—if money is no object.

(To be continued)

Facing a Worm Gear on a Lathe

A worm gear having a large lead, say, 3 or 4 in., may be easily faced on a lathe with the attachment shown in the illustration. Fasten two studs in a plate so that they will enter the screw snugly, and attach the plate to the crosshead of the lathe directly beneath



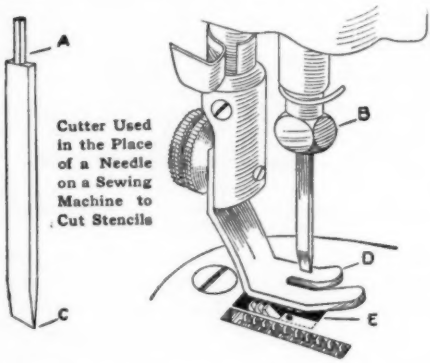
The Worm as it Turns in the Lathe Centers Causes the Proper Feed of the Carriage

the center of the screw, when the latter is set in the centers of the lathe. The proper tool is then placed in the tool post, and the lathe started. The pins will cause the carriage to travel with a speed equal to the travel of the screw, and the tool can be fed as in ordinary lathe work.—Contributed by D. J. Jones, Massena, N. Y.

¶A piece of candle is often quite useful for the motorcyclist. It can be placed in the headlight, or put on the belt for oil, and used to prevent "shorts" by applying to the spark plug in damp weather.

A Stencil-Cutting Machine

A machine for cutting stencils may be very easily made by slightly altering a discarded sewing machine, and



Cutter Used in the Place of a Needle on a Sewing Machine to Cut Stencils

supplying a cutter in the place of the needle. The cutter is made from a piece of spring as long as the needle used in the machine. It is cut and filed as shown, the end A being filed round on two edges and the hole in the needle holder B filed to concave on one side with a small round file. If this is carefully done, the end A of the blade will fit snugly in the holder. The end C is filed to a cutting edge and sharpened on an oilstone. The slot in the foot D, Fig. 2, should be filed on both sides so that the blade will just pass through. The opening in the foot plate E is filed on the right side as shown by the dotted lines, so that the blade will not strike it. The machine will take work 18 in. wide, if half of it is done from one end and the remaining part from the other.—Contributed by C. L. Herbert, Chicago, Ill.

Cutting Trees with Wire

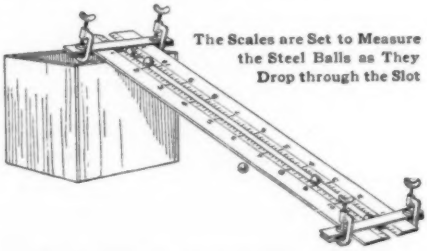
A wire heated with an electric current has often been used to saw through large trees or rather to burn its way through. A later and neater method of felling a tree is to move a fine wire back and forth with great rapidity by an electric motor so that the wire, heated by friction, burns a narrow cut through the tree. The cut is cleaner than a saw cut, and the method permits the cutting to be done below the surface of the earth so that no stump is left. A central power plant could be located in a forest to supply current for portable motors.—Contributed by Harry N. Holmes, Richmond, Ind.

To Clean the Surface of a Whetstone

The uncovered whetstone soon takes on a gloss from dust particles that collect on it. This smooth, glossy surface can be easily removed by applying powdered pumice to the stone just before using it. This treatment removes the grit, and the knife blade will be polished. At the same time it is quickly ground to a good edge. The powder can be kept ready for use in a face-powder can with a shaker top. —Contributed by J. Harry Priestley, Lawrence, Mass.

Separating Steel Balls of Different Sizes

A manufacturer of automobiles discovered that a large stock of steel balls, from which balls were taken for a thrust bearing, were not all true to size. The first attempt was to measure each ball with the micrometer, but the number was so great that the job became tedious. After measuring about 500 balls in this manner the workman devised a plan which readily separated the balls quickly and accurately.



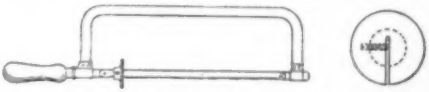
The Scales are Set to Measure the Steel Balls as They Drop through the Slot

Two ordinary 12-in. steel scales were procured and their ends placed between two strips of metal that were used to clamp them solidly when the space be-

tween the scales was found. Two balls were selected from the lot, one of them .0005 in. under size and one .0005 over. The smaller ball was placed between the scales at the top and the larger at the bottom. The space taken up at each end by the ball and strips was just 1 in., thus making the opening between the scales only 10 in. long so that each division represented .0001 in. The scales were placed at an angle of 45 deg. and the balls were allowed to roll down in the slot between them. When a ball reached a space large enough to drop through its size would be designated by the reading of the scales at that point, and receptacles were placed beneath to catch the different-sized balls. Those passing through at the center of the scales were the ones kept for use in thrust bearings.—Contributed by Henry J. Marion, Pontiac, Michigan.

A Hacksaw Reflector

Occasionally the repairman is called upon to use a hacksaw where the light is poor, and in such cases it is difficult to cut to the line. A correspondent of

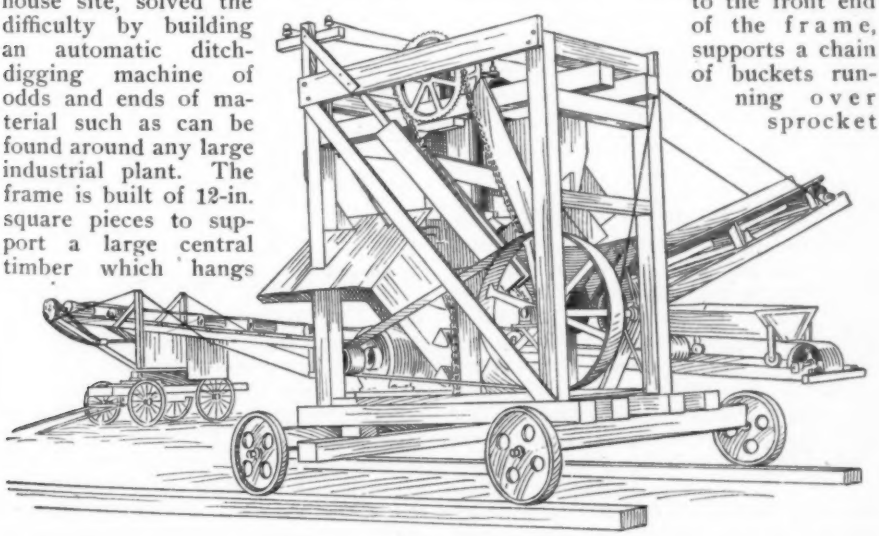


The Light is Reflected on the Line of the Work to be Cut

Motor Car uses an easily made device, which is fitted over the saw blade, to reflect the light on the work. It consists of a round disk of sheet brass or other light metal, which is turned to have a collar at the back and enameled white on the face. A slot is cut through the center so that it may be slipped over the blade of the saw. The reflector is held in place with a set-screw.

Homemade Ditch-Digging Machine

A contracting firm, unable to procure day laborers in sufficient number for excavation work on a large storage-house site, solved the difficulty by building an automatic ditch-digging machine of odds and ends of material such as can be found around any large industrial plant. The frame is built of 12-in. square pieces to support a large central timber which hangs loose on a heavy rod at the top. The swinging timber, which is kept against the earth by a wire cable fastened to the front end of the frame, supports a chain of buckets running over sprocket



A Machine Constructed for Excavating Ditches for Concrete Walls of a Large Cement Storage House

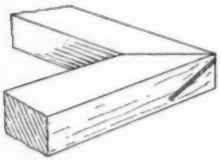
wheels at its upper and lower ends. Two men loosen the earth in front of the buckets, which carry the dirt up and dump it on a short elevator that, in turn, drops it into a hopper set over a moving belt. The belt runs over rollers whose bearings are attached to a long framework supported on cables and resting on a truck at the outer end. The hopper can be moved along on the long framework as the machine moves forward over the ditch. The belt carries the loose earth to the point where it is dumped or loaded into wagons. The machine is driven by two electric motors, one 10 and the other 6-hp., and can handle 250 cu. yd. of earth in 10 hours. The framework, being mounted on wheels, can be moved to any location where excavating is to be done.—Contributed by R. J. Wheeler, Allentown, Pa.

Compression Spring for an Oilcan Bottom

An old oilcan, or a new one for that matter, not having sufficient spring in the bottom may be supplied with a supplementary spring in the following manner: An open coil spring is fitted around a brass tube whose upper end is made tapering to fit the inside of the spout on the oilcan and the lower end cut so that the space between it and the bottom will be about ½ in. A piece of thick leather is cut to fit the end coil on the spring at the bottom to prevent any wear on the metal.—Contributed by Edwin Menger, San Antonio, Tex.

Lock for a Miter Joint

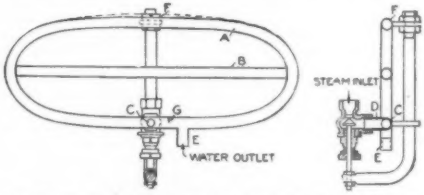
Picture-frame joints, or mitered joints for any piece of work, may be made better and more solid by locking them with a key. The parts will then stand considerable strain of pull or pressure in opposite directions without damage to the joint. The manner of making the key lock is clearly shown in the sketch. After the parts are mitered and fit closely together, a wide saw cut is made across both parts and in a downward direction. This cut is filled with a well-glued wedge.—Contributed by F. H. Tillotson, Sycamore, Ill.



A Steam Trap

An automatically operating device for exhausting condensation water has recently been brought out by a German firm of machinists. It differs from other devices of this kind by its simplicity, the easy accessibility of all its parts and the absence of movable and therefore easily worn parts, so that it is safe and reliable.

It consists of an elliptic steel tube, A, which is braced across its longer axis by another tube, B, that has no connection with the tube, A, however, but prevents the device from expanding through the heat of steam or water in any other direction than the vertical. At the point C there is a connecting piece of pipe, D, through which the water is admitted, and at E, one for letting it out. Screwed onto D is a valve which is connected to the steam system. The valve stem is rigidly connected to the tube A at the point F, so that all relative motion of



An Efficient Steam Trap for Placing at the Lowest Point in a Steam Line

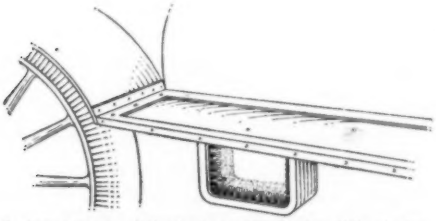
the points C and F are duplicated by the cone of the valve stem. When the distance between C and F is increased, the valve is closed; when decreased, it is opened.

Should the elliptic tube become thoroughly heated by the steam entering, it tends to expand, but can only do so in a vertical direction so that the valve immediately closes, and steam cannot enter. When the tube cools off, the valve opens admitting the water.

In use, this process is self-regulating, so that the valve is open only just long enough to allow the water to flow out. In order to further prevent escape of steam, a small baffle plate, G, is inserted between C and E, which closes off the upper half of the tube. Air that may come with the steam is heavier than the latter, and therefore flows away before the steam, so that the device thus also serves to free the steam system from air.

Shoe Cleaner for an Automobile Running Board

Although devices permitting the automobilist to scrape the mud from his shoes before entering the car are fairly common and several manufacturers have incorporated them in their designs for the coming season, none is quite so ingenious or so well designed as the one shown in the sketch. This is adopted by a foreign manufacturer. As may be seen, the scraper is attached beneath the running board and consists

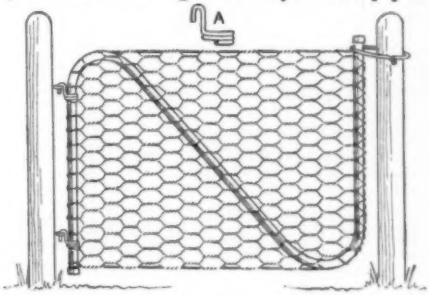


A Shoe Scraper Attached to the Under Side of the Running Board on an Automobile

of a brush which not only removes the mud from the soles of the shoes but takes it from the sides as well.

Gate Made of Piping

A short-line railroad utilized a quantity of old discarded pipe for making gates on their right of way. The pipes



Gate Frame Made of One Piece of Pipe Bent to Hold the Fencing Material

were bent into the shape of the letter S, the vertical end pieces being left straight and the fencing material attached to them. The hinge device consisted of a piece of heavy wire bent as shown at A. The hook part fits into the opening of a large screweye or eyebolt fastened in the post. A latch can be made of a wire loop and used in the manner shown.—Contributed by Maurice Baudier, New Orleans, La.

Measuring Hay in a Stack

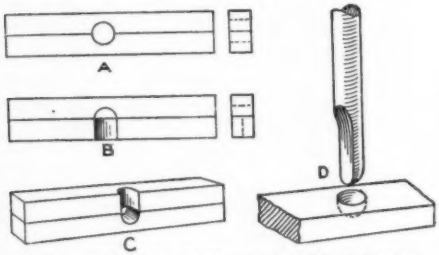
There can be no set rule for obtaining the amount of hay in a stack, but approximate tonnage may be determined in the following manner. Measure the base of the stack each way, then measure from the base on one side, over the top and to the base on the other. Multiply the length by the width and the result by ⅓ of the length over the top. This will give the number of cubic feet in the stack.

The number of cubic feet of hay in a ton must be reduced in proportion to the time it has been stacked. Of newly stacked hay, before any settling takes place, about 500 cu. ft. are required to make a ton. Three months of settling will reduce the number of cubic feet to 400.

If a stack is not put up on straight lines, several over-top measurements must be made and the average taken.

To Make Holes in Metal with Hemispherical Bottoms

On a certain piece of work holes with perfect hemispherical bottoms had to be made and for cutting out this part



Shaping a Tool for Cutting Perfect Hemispherical Bottoms of Holes Drilled in Steel

of the drill hole a special tool was required. As accuracy was necessary the tool edge had to be a perfect half circle on the proper radius. The edge was shaped as follows:

Two short lengths of ¼-in. square tool steel, A, were clamped together in a hand vise and a hole of the desired diameter was drilled through the joint crosswise, so that when the pieces were separated, exactly one-half of the hole came within each piece. The pieces were then hardened and again returned to the hand vise, but not in the same position as when drilled. The two half-circular cuts were placed at right angles to each other, as at B, and then clamped so that the edge on the face surface resembled a U, as shown at C.

The twist drill used for drilling the hole was reversed in the chuck and the shank slowly rotated against the two pieces in the hand vise at the union of the two half holes. The effect of this was to scrape off the end of the shank until it assumed the form of a perfect hemisphere.

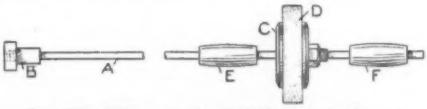
The next step was to cut a flat place on the shank, as shown at D, to form a cutting edge and also make room for the cuttings. This was accomplished by removing one of the hardened pieces from the hand vise and placing the drill shank in the groove, then filing until it was cut down to the hardened steel or just half the diameter of the drill, as shown at D. The hardened steel makes the gauge and jig at the same time. After hardening the tool, it did perfect work.—Contributed by Wm. G. Toplis, Philadelphia, Pa.

Substitute for a Flexible Shaft

The advantages of a flexible-shaft grinder for polishing and general grinding purposes have long been conceded, but a flexible shaft is rather too expensive for those who have not much of this work to do. A very fair substitute can be had by making a shaft as follows:

The shaft A is made of a piece of ¼-in. cold-rolled steel, 10 ft. long, and the pieces B and C are shrunk on so as not to weaken the shaft. The head B is threaded to fit the spindle of a grinder running at about the proper rate of speed. The head C has a shoulder at one end and a stem which is threaded for a nut and collar, to hold the buffing wheel D. Two wood handles or grips, E and F, are a loose fit and are held in place by a set of collars not shown in the sketch.

In operation, the workman takes a grip in each hand, after attaching the grinder tightly on the shaft, and applies it to the work. The ¼-in. shaft is sufficient to transmit all the power supplied to a machine for doing a similar kind of work. The shaft gives a range of about 3 ft. without serious or tiresome cramping. A hook or snap should be provided to hold the free end of the shaft while the operator is



The Flexibility of the Cold-Rolled Shafting is Sufficient to Give a Range for Ordinary Work

not polishing, but wishes to leave the wheel in motion.—Contributed by D. A. Hampson, Middletown, N. Y.

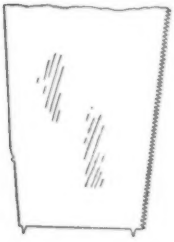
¶Ground glass should never be lettered on the ground side, as the paint stain cannot be removed.

To Keep Bright Metal Free from Rust

If the neat workman cares to keep his machine clean and free from rust, he should use a mixture of melted lard and camphor in the proportion of 1 lb. of lard to 1 oz. of camphor, to which is added sufficient black lead to give it color. Rub this mixture on the machine parts, after they are well cleaned, and allow it to stand for a day, then rub it off with a clean cloth. This will keep rust from bright parts and the machine in a good appearance.

Preventing Handsaw from Slipping When Standing on End

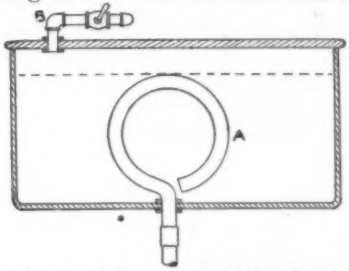
As I was much annoyed by having the handsaws that were leaned against a sawhorse or other support when not in use slip and fall to the floor, I filed two points on the end of each saw blade to hold the saw where it was set.



The saw blade should be filed off square at the end and at right angles to a line on the center of gravity. Two teeth are then formed by filing away sufficient metal on the blade. The teeth should be located near the sides. A saw fixed in this way will stand in almost any place or position.—Contributed by Howard Weddle, Dinuba, Cal.

An Intermittent Siphon for Flush Tanks

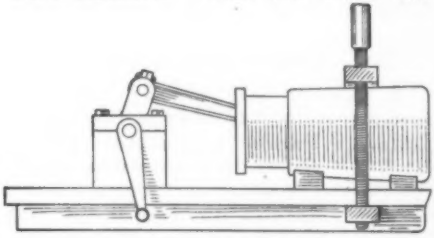
The intermittent siphon for flush tanks, shown in the sketch, consists of a piece of ⅞-in. pipe bent as at A and placed in the tank in an upright position. The inlet B should have a valve attached. The siphon will not act until the water reaches the level shown by the dotted line, when the air will be driven out of the curved pipe. By turning the valve in the inlet pipe the rate of incoming water can be regulated and the box emptied at any interval desired. The amount of water coming in must of course be less than the amount which can pass out of the outlet.—Contributed by Olaf E. Tronnes, Evanston, Ill.



The Length of Time for Flushing is Regulated by Valve on the Inlet Pipe

Grinding In Piston Rings

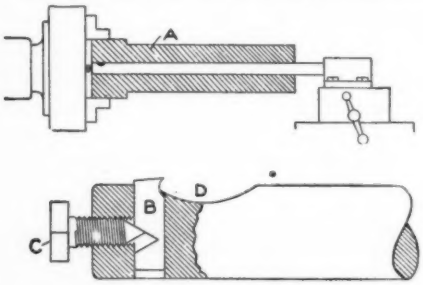
While overhauling an automobile the owner decided to put in new piston rings, and as the cylinders were slightly worn, it was considered best to grind the new rings in to fit the cylinder bore before replacing the cylinders, thus immediately obtaining a better fit rather than waiting until the rings had in actual service worn themselves to the shape of the cylinder. In order to make the job less laborious, the rig illustrated was constructed. The cylinders were placed on a block on the bench, to which they were secured with a carpenter's parallel-saw clamp. A crude shaft was made of a piece of pipe and on it a wood crank and a wood handle were fastened. With this outfit the work was made easy, and the cylinders could be perfectly cleaned of the abrasive used with no danger of its getting into the bearings.



Temporary Arrangement for Grinding in New Piston Rings to Fit the Bore of a Worn Cylinder

Keyseating in a Lathe

Having to cut a keyway in a sleeve that was too long for our keyseating machine, the job was accomplished on



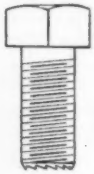
The Sleeve as It is Set in a Lathe Chuck and the Cutter-Bar End

a lathe in the following manner: The sleeve A was set true in a lathe chuck and a piece of cold-rolled steel that was a sliding fit in the bore of the sleeve was used as a cutter bar, one end being drilled to hold the cutter B and tapped for a feed screw, C. A place was cut out of the bar, at D, to carry the chips away.

The bar was held in the boring-bar holder, and, with the lathe not running, the bar was run into the bore of the sleeve until the cutter cleared the end at the chuck. The screw C was then turned, which set the tool to take a cut, and then the carriage run back by hand, the tool cutting as it was pulled through the bore. The operation was repeated until the keyway was cut to the proper depth.—Contributed by F. L. Pyle, Chicago, Ill.

Locking a Setscrew

A setscrew can be easily locked by the use of notches filed in the end as shown in the sketch. When the screw is turned in tightly the raised portions will sink deeply into the metal and prevent the screw from coming loose.—Contributed by G. H. Holter, Jasper, Minn.



¶A sanitary paper towel makes a good substitute for filter paper.

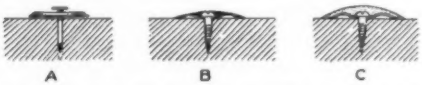
Draining an Automobile in a Garage

It is prudent, of course, to drain all the water from the radiator of an automobile every night during cold weather. It is annoying to place the car outside the garage while the water drains slowly out, and it is equally aggravating to have the garage floor covered with water. If the floor is of wood, this trouble may be easily overcome.

Bore a 1-in. hole in the floor directly under the drain petcock and place in it a wide-mouthed funnel. Put a mark on the floor as a guide for the front wheels and it will be easy to stop the car so that the petcock will be right over the funnel. When the water is all drained out, allow the engine to run for half a minute to evaporate any water left in the radiator, pump, or water jackets. It is always well to drain all water from the water jackets of the carburetor also.—Contributed by J. R. Quirk, Wheatland, Wyo.

Stopping Leaks in a Tin Roof

The usual method of fastening roofing of any kind is to drive a small nail through a tin disk and the roofing into



Disks Fastened with Screws and Soldered to a Tin Roof Make Permanent Repairs

the sheathing beneath. When a tin roof fastened in this manner bulges, it will draw out the nail, and the expansion and contraction of the metal will leave the nail and disk in the position shown at A. If a screw, brass or iron, is used, this difficulty can be prevented. After the disk is screwed down, solder the head of the screw to the disk, and the edge of the disk to the tin roofing, as shown at B. If soldering is impossible, cover the disk with putty as at C. A leak can be stopped by fastening one of these disks over it in the manner described. In either case, the disk should be given a coat of paint after it is fastened down.

A Steam Trap for Heating-Coil Drainage

By F. W. BENTLEY, Jr.

The perfect drainage of large heating coils which are necessarily located a considerable distance from the boiler is often a difficult proposition. The difficulty in securing an efficient means for draining such coils arises more in connection with coils which are placed in different and separate buildings of a plant, all of which are supplied with steam from the same boiler. This condition, of course, prevents a return of condensation to the boiler, and necessitates the use of some other provision for the drainage of the heating coils.

A great many styles of traps and water drains are on the market, it is true, but most of them are designed with a view toward assisting the manufacturer in the sale of other machinery in connection with them; this condition often making it impossible to secure such a device for certain drainage purposes without paying an exorbitant price for its special manufacture.

The principal requisites of a steam trap for the drainage of heating coils are reliability and simplicity. The general appearance and location of a drain or trap that can be constructed with but very little expense is shown in Fig. 1. All operating parts are of metal, and the trap itself can be cheaply and readily constructed in any local machine shop possessing even a very limited equipment.

The construction of the trap and the principle of its operation are very simple. Saturated steam from the lowest point in the coils enters the trap at A, Fig. 2, accumulating at the bottom of the trap, below and around the basin B and floating it. To the inside bottom of the basin B is soldered the hollow perforated sleeve C, the inner bottom part of which forms a seat for the hollow stem D. The buoyant force of the water around the basin B consequently keeps this joint perfectly tight. However, as the water rises in the trap from the accumulation of condensation, it finally flows into the basin B over its top. Water will run into the basin only until the weight of water accumulating in it overcomes the buoyancy of the water around and below it, when the basin and consequently the sleeve C drop away from the hollow stem D. This action allows the water in the basin to be forced up through the hollow stem D to the atmosphere, through the connecting drip pipe taking away

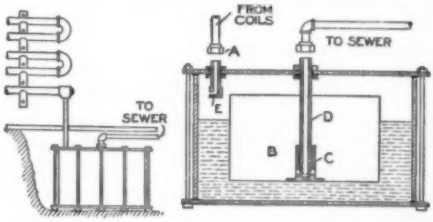


Fig. 1 Fig. 2

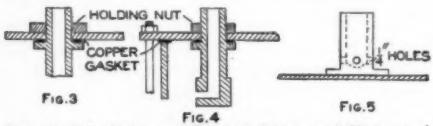
Location of the Steam Trap on the Radiator and the Detail of Its Construction

the condensation. This action of the trap continues until water enough escapes from the basin to allow the buoyancy of the water below it to force the basin upward, bringing the sleeve C in contact with the stem D and closing the trap.

The sleeve C should be bored so as to allow only a free and easy slide of the sleeve over the stem D, after which the joint or seat at the bottom should be carefully ground in with the stem, to prevent an escape of steam when the basin is emptied of water and forced upward by the buoyancy of the water around and below it.

A detail sketch of the stem D is shown in Fig. 3, to illustrate the manner in which it is attached to the top head in order to allow the copper gasket to form a tight joint when the holding nut on top of the head is tightened. The inlet E is shown in Fig. 4 and is constructed and fastened to the top head much in the same manner. Its lower opening should be at one side of the basin B and below the top of the same when in either closed

or discharging position. The opening is turned so that the slight pressure of the steam entering the trap is exerted against the walls of the cylinder in-



Detail of the Inlet and Turned Parts, and Manner of Connecting Them to the Trap

stead of against the basin B, which might tend to cause the sleeve C to bind on the stem D and prevent the trap from working with any degree of sensitiveness. The basin B should be constructed of copper in order to prevent its corrosion by the water and steam. When soldering the sleeve to the bottom of the basin care should be taken to locate it centrally, otherwise the buoyant force of the water acting on the basin might be exerted unevenly and cause the sleeve to bind on the stem D. The detail of the part C is shown in Fig. 5.

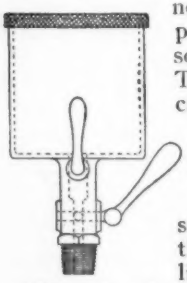
In order to show the cheapness of such a trap, the details of one which the writer constructed for draining the coils heating an office building are given. The coils in question were composed of 20 pieces of 1-in. pipe, 15 ft. long and connected by return els.

In the construction of the trap, a piece of 8-in. pipe, 10 in. long, was used as a cylinder. Two round plates of sheet iron, ⅜ in. thick, were used for the heads. The heads, cut to a diameter of 10½ in., were bolted to each end of the cylinder by eight ½-in. bolts, 11 in. long. The parts C, D, and E were turned on a small lathe in less than two hours. The upper end of E was turned to take a ¼-in. union attached to the ¼-in. nipple which drains the coil.

The superiority of this homemade trap lies in the fact that there are no rubber diaphragms to rot or decay, or thin metallic ones to burst, in case the trap should freeze up. As the trap will continually dispose of condensation as long as there is the least amount of pressure in the coils, there is no danger of either the trap or coils freezing up in the coldest of weather.

A Priming-Cup Tank

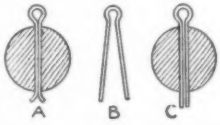
Priming cups of various designs are furnished on most autos, but they all have one fault: when the gasoline is needed for priming purposes, it is generally in some inaccessible place. The oilcan which is carried for this purpose is usually empty, and the motorist is compelled to crawl under the car and get a sufficient amount from the carburetor or gasoline tank.



The sketch shows an original idea which will overcome this fault. A small tank, which is fitted with two shut-off valves, is attached to the priming cup. When the upper valve is closed and the lower opened, the gasoline in the space between the two valves is injected into the cylinder and a rich mixture is formed for easy starting. Then, by closing the lower valve and opening the upper, the device is ready to be used again.—Contributed by Edwin M. Wise, Toledo, Ohio.

Fastening Cotters

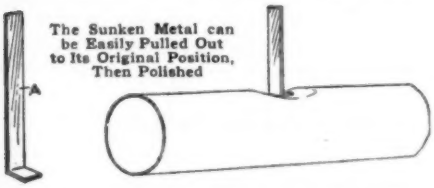
A common method, used by almost every machinist, is to drill a hole for a cotter the same size as the diameter of the pin and after inserting the cotter to spread its ends with a chisel or screwdriver so as to give them a short hook or bend as shown in the sketch A. A cotter, fastened in this manner, is hard to remove. A better way is to drill the hole about .005 or .01 in. larger than the diameter of the cotter. Open the pin B with a



screwdriver, which gives it a spring tension; then, when the cotter is inserted, the tension will hold it in place and it cannot be jarred out, while at the same time it is easily removed and will retain its shape.—Contributed by Walter Butz, Pearl River, N. Y.

Removing Dents from Thin Metal Articles

Dents in any kind of sheet metal, especially the brass fixtures of an automobile, are exceedingly difficult to straighten out and make a neat-appearing piece of work. One of the best methods of doing this is to make a clip of metal, steel or brass, as shown at A in the sketch, and solder the small part turned at right angles to the metal in the dent. The sunken metal can

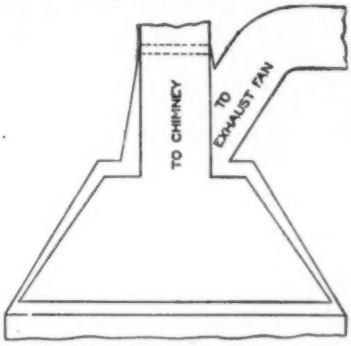


The Sunken Metal can be Easily Pulled Out to Its Original Position, Then Polished

then be pulled up, the clip unsoldered and the surface polished. It is not necessary to drill a hole in the fixture and the surface can be smoothed up like new.—Contributed by Chas. Kaufman, Santa Ana, Cal.

Smoke Hood for Forges

The ordinary hoods over a blacksmith's forge, which are supposed to carry the smoke and gases directly into the open air or into the factory chimney, have all the disadvantage that the draft is usually only strong enough to carry away the hottest smoke and gases, while the cooler ones as a rule roll out under the edge of the hood into the rooms which is the main reason why blacksmiths always have grimy faces and inflamed, red eyes. With an auxiliary hood fitted over the ordinary hood, its lower edge extending a little below the latter, leaving only a narrow space between the two hoods, and provided with an exhaust pipe of its own, which may lead to a window or perforation in the wall

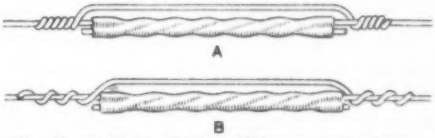


An Auxiliary Hood and an Exhaust Pipe to Expel All Smoke from a Forge

where a fan is placed, all the smoke will be expelled and the air in the room is kept fresh and clean.

Soldered Joints on Telephone Wires

A large percentage of telephone troubles is usually found in poor connections caused by neglect and carelessness of the construction and repair men, says a correspondent of Telephony. Upon repairing a new copper wire with an old one, in which the joints had been bridged and soldered, a very noisy circuit was found. When investigated, it was discovered that all joints had been bridged, but, in soldering the bridging wires, many loose connections were overlooked. The bridges were made as shown at A. That is, the bridging wire was wound around the line wire in a closed coil and the solder applied to the outside of the coil. This resulted in all the solder



The Closed Coils will Not Make as Good a Joint as the Open Coils

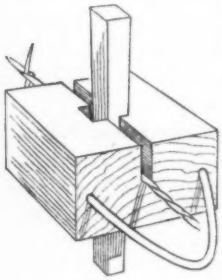
on the bridging wire being held on the outside, so that none reached the line wire. This made loose connections between the bridging and the line

wires. The proper method of connecting the bridging wire is shown at B. By leaving plenty of surface of the line wire between the turns of the bridging wire, solder will take hold of both wires equally well, and a good joint will be made.

In soldering drop wires to the line wires, the same care should be taken and the joint made practically the same as shown at one end of the sleeve in sketch B.

A Fence-Wire Grip

The grip consists of a block of wood grooved to receive the wire and fitted with a wedge for the holder. The groove should be cut about one-half the depth of the block, and a hole bored in its center and squared to receive the wedge. The hole should be in such a position that the wire will be slightly kinked when the wedge is driven in tightly. The block is also fitted with a wire loop at one end to attach to the wire stretcher. Holes are bored through the block and the ends of the wire loop inserted, and twisted together or otherwise fastened.



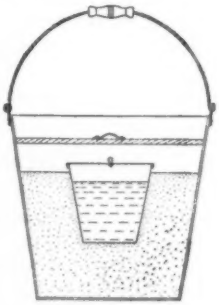
Working Self-Hardening Steel

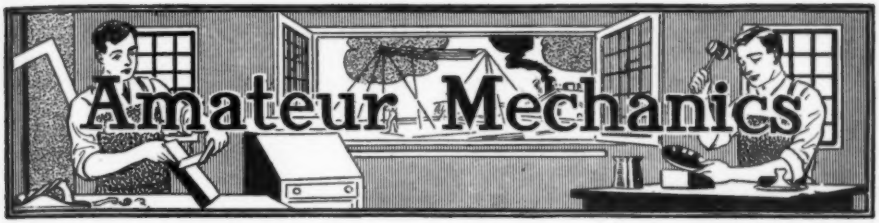
Self-hardening steel, used so much for tool holders in repair work where high-speed steel is too expensive, is too hard to be worked into special shapes. It can be forged at a low red heat, but must be used carefully as it is very brittle. While red hot, it can be filed. It is well to know this, and, while using a file on hot metal is not good practice, circumstances sometimes compel one to do it.

Bought in the bar, self-hardening steel is expensive, as it is wasteful to cut it up into tool lengths. Cutting it up by a friction saw is not wasteful, but few steel users have this tool. When broken off in a vise with the aid of a big wrench, its irregular fracture causes waste of stock and much loss of time in grinding it to shape. The same is true when it is nicked all around on the corner by grinding it on an emery wheel and then breaking The long, rounded projection must be ground off before using. Cutting on the anvil with a chisel, when hot, is fairly economical, but a better way is to nick it deeply on the bottom by placing it on the corner of a revolving emery wheel and nicking the sides slightly, or otherwise as desired, leaving the top flat, then breaking off the piece. The amount of grinding and the way it is ground by this three-side method enable one to control the line of fracture and produce a tool whose general shape is already formed so that it requires a minimum of finishing and no loss of stock is caused.

Heat-Retaining Pail for Pitch

In laying a paper roof on a cold day I experienced some difficulty to keep the pitch warm enough to work well. To overcome this trouble I constructed a heat-retaining pail, as shown, which keeps the pitch in a working condition for a much longer time on a cold day. An old wooden bucket was secured and lined with newspapers. Then the bottom was covered with hot sand to a depth of 3 in., the smaller pail with the pitch set on this and the sides filled in with hot sand in the manner of packing an ice-cream freezer. Covers were made for each pail, as shown. This device has kept pitch at a working heat for six hours on a very cold day.—Contributed by Alfred H. Rose, Ipswich, Mass.





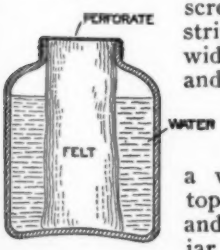
Freezing a Basin to a Chair

Fill a basin or pot half full of snow, and secretly put a handful of table salt in it and place the vessel on a chair or table, wetting the space where it is to be set. After holding the basin in place for about two minutes, continually stirring the contents, it will freeze to the chair so solidly that when the basin is lifted the chair will come along with it.

This experiment is quite interesting to an audience and can be performed at any assemblage with success. If the instructions are carried out closely, the trick will always succeed and the audience will consider it magic. Even if performed in a warm room, the combination of snow and salt will reduce the temperature below the freezing point where the bottom of the vessel comes in contact with the chair seat.—Contributed by Harry Slosower, Pittsburgh, Pa.

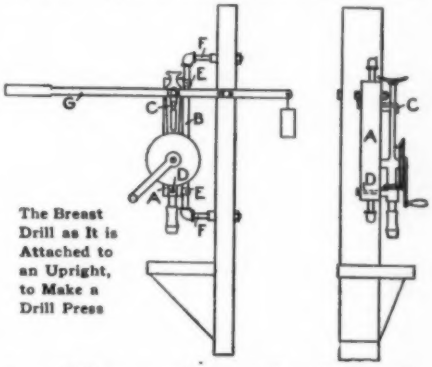
An Envelope and Stamp Moistener

A moistener for postage stamps or envelopes can be easily made from a screw-top jar. A strip of felt cut as wide as the jar is deep and made into a roll large enough to fit the neck of the jar serves as a wick. The metal top is perforated, and, after filling the jar with water, it is screwed into place. This makes a very inexpensive moistener for the library desk.



A Homemade Drill Press

An ordinary breast drill is used in the construction of this drill press, it being rigidly secured to a piece of oak, A, 2 in. square and 18 in. long, which



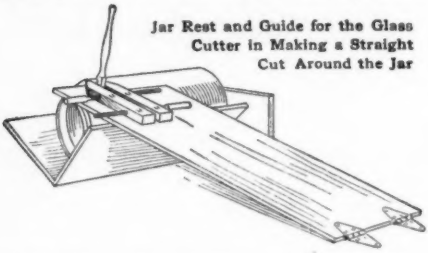
The Breast Drill as It is Attached to an Upright, to Make a Drill Press

is a sliding member on the pipe B. In attaching the breast drill to the wood, a bolt, having a hook on the head end, was used at the top, at C, and a stud at the bottom D. Pipe clips, EE, were attached on one side of the block to fit loosely over the pipe B. The vertical part of the pipe is supported by two horizontal pieces, FF, which are fastened to a post. A feed lever, G, is pivoted at the top of the vertical piece of oak A and fulcrumed on the post with a bolt through a slot, the extending end carrying a weight as a counterbalance. The illustration clearly shows the construction of this very useful drill press.—Contributed by W. A. Ready, Boston, Mass.

¶A pair of bicycle trousers guards makes excellent sleeve bands when the cuffs are turned back and rolled above the elbows.

Battery Jars Made of Bottles or Fruit Jars

Many amateur experimenters, especially those interested in electricity, frequently require a medium-sized battery jar, or container, for the different



Jar Rest and Guide for the Glass Cutter in Making a Straight Cut Around the Jar

batteries, condensers, rectifiers, etc., which, as a rule, are not procurable in the rural districts and small towns, and when ordered from a distance are slow in coming. Battery jars that are very inexpensive and convenient can be easily made in the following manner:

Purchase a number of 1-gal. bottles, or large fruit jars and arrange to cut off their tops. Nail two boards together so as to form a right angle, which is to serve as a rest for the jar, and an aid in making a perfectly straight cut around it with a glass cutter. No doubt, all experimenters have a vise of some kind, or an ordinary wooden clamp, that they can use in holding the glass cutter rigidly in a fixed position. Nail a board across one end of the jar rest, place the jar in the rest with the bottom of the jar against the closed end, and then fasten the clamp or vise holding the glass cutter in position, making sure the cutter is at the proper cutting angle and the correct distance from the bottom of the jar. Now rotate the jar until a complete circle is made and then the top can be easily removed by tapping on the inside with a file or other instrument directly beneath the cut.

A simple arrangement of jar support and cutter is shown in the accompanying sketch. The support for the cutter is hinged at one end so that the cutter may move up and down to correspond to the irregularities in the surface of the jar. A slight pressure should be applied to the cutter as the jar is rotated.

Protector for Photographic Prints

Photographs to be mounted on calendars, match trays, glove boxes, pyrographic novelties, and many similar articles, can be protected with a piece of negative film. The film is cleaned of its coating by using hot water and soda. When the film is dry, it is squeegeed to the wet photographic print, if the print has a glossy surface; but if the print has a mat surface, a thin coating of starch paste must be used. In the latter case, the film should be squeegeed quite forcibly to press out the surplus paste. The print and its covering can be trimmed to any desired shape and used in many ways.

The prints can be fastened to brass or aluminum work with shellac. They also can be used in ornamenting leather goods, such as card cases, pocket books, and hand bags. If one knows how to color the prints, the effect of porcelain paintings may be obtained.—Contributed by Albert Gibson, Chicago, Ill.

An Alcohol Lamp

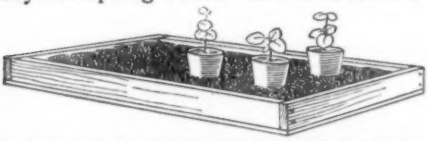
Procure an empty brass cartridge case, A, 3 or 4 in. long, and cut or file off the narrow or thin part that holds the bullet, or, preferably, procure a shell which is of a uniform diameter for its whole length. After doing this, drill eight small holes, B, around its circumference at the base end as near the rim as possible. The shell is then fitted with a round wick almost up to the level with the holes. The outside is fitted with a circular

piece of wick, C, of sufficient length to dip into the alcohol in the bottle and protrude about ⅛ in. above the bottle neck. An ordinary alcohol-lamp retainer will do, but its neck should be of sufficient diameter to allow the outside wick to slip in easily.

The outside wick C is lighted and the heat vaporizes the alcohol within the shell A, which will rush out through the holes B and burn, making a large and hot flame. Owing to the intense heat of this lamp it is very handy for soldering and for laboratory use.—Contributed by H. Vincent, Yokohama, Japan.

Transplanting Plants

Many plants for the garden are grown in hot beds or greenhouses and are transplanted when the warmer days of spring come. If the roots are



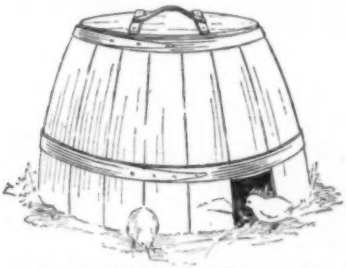
Each Plant is Grown in an Individual Cylinder Which can be Transplanted Bodily

disturbed or not sufficient soil left on them, the plant will have a setback and it will require considerable attention to make it grow. One gardener devised a plan whereby the plant roots are not disturbed in the transplanting. His method is to prepare a box with loose-fitting sides to carry a number of paper cylinders in which each plant is grown until it is large enough for transplanting.

The cylinders are made of oil or wax paper, slightly tapering and without top or bottom. The bottom of the box is first covered with a layer of soil, then the cylinders are set in and filled, whereupon the box is filled in with soil around the cylinders to aid in holding the moisture. When transplanting time comes the cylinders containing the plant are removed to the garden and set in the earth. The paper may be left in place, as the roots can grow through it.—Contributed by Warren E. Crane, Cleveland, O.

Brooder for Small Chicks

A very simple brooder can be constructed by cutting a sugar barrel in half and using one part in the manner

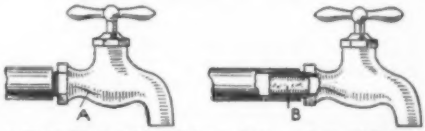


Brooder for Young Chicks Kept Warm with a Jug of Boiling Water

described. Line the inside of the half barrel with paper and then cover this with old flannel cloth. Make a cover for the top and line it in the same manner. At the bottom cut a hole in the edge, about 4 in. deep and 4 in. wide, and provide a cover or door. The inside is kept warm by filling a jug with boiling water and setting it within, changing the water both morning and night. When the temperature outside is 10 deg. the interior can be kept at 90 or 100 deg., but the jug must be refilled with boiling water at least twice a day.

Faucet Used as an Emergency Plug

A brass faucet split as shown at A during a cold spell, and as no suitable plug to screw into the elbow after removing the faucet was at hand, I drove a small cork, B, into the end of the faucet and screwed it back in place. The cork converted the faucet into an

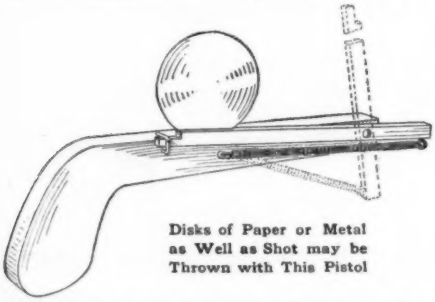


A Tight-Fitting Cork Driven into a Cracked Faucet Converted It into an Emergency Plug

emergency plug which prevented leakage until the proper fitting to take its place could be secured.—Contributed by James M. Kane, Doylestown, Pa.

Disk-Throwing Pistol

A pistol for throwing small disks of paper or metal balls, can be easily made at almost no expense as shown in the sketch. Two pieces of board,

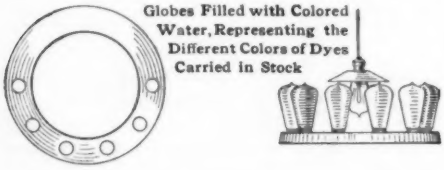


Disks of Paper or Metal as Well as Shot may be Thrown with This Pistol

one of which is shaped to the form of a pistol, are hinged together and a fairly strong spiral spring is fastened at the front end of the movable piece and the middle of the other. A slot is sawed in the movable piece to hold the disk, or a small round depression may be formed in it to receive a bean, pea, or shot. The movable arm is folded back and held in position by means of a stirrup of wire fastened on the other part. When the movable part is disengaged by pulling the stirrup away with the finger, the disk will be thrown with considerable force, depending on the strength of the spring.

Displaying Dye Colors

A certain druggist utilized old electric bulbs for displaying dye colors. Water was colored with a dye and the end of a bulb dipped into the liquid. Then the tip end was broken off, and



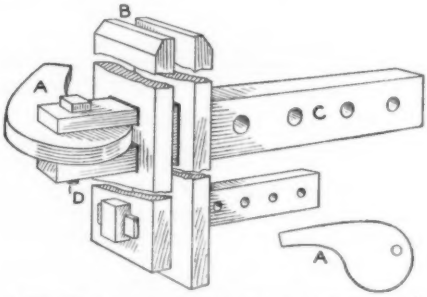
Globes Filled with Colored Water, Representing the Different Colors of Dyes Carried in Stock

the bulb being a vacuum, the colored water was drawn into it, and filled the globe. The point was then sealed with paraffin.

A ring-shaped piece, 15 in. in diameter and 2½ in. wide, was cut from a piece of board, and 1-in. holes bored, 2½ in. apart, in one-half of the ring. The globes holding the colored water were set in these holes and a light with a round shade placed in the center. It proved to be an attractive display and a good method of showing the colors.—Contributed by Maurice Baudier, New Orleans, La.

A Homemade Bench Vise

A serviceable and inexpensive bench vise can be made in the following manner: Procure a piece of hard wood, 1 in. thick, and shape it into an eccentric with an extending handle, as shown at A. The jaws B are made of material 2 in. thick, and the drawbar C is a 2



A Vise That can be Quickly Constructed Where No Bench Vise is at Hand

by 3-in. piece of hickory. The outer end of the bar is slotted to receive the eccentric handle, through which a bolt, D, passes to form a bearing. Holes are bored into the opposite end of the bar, 2 in. apart, into which a peg is inserted to come against the back side of the rear jaw. This provides an adjustment for a range of various thicknesses of material. Another bar is located at the bottom of the jaws to provide a means of keeping the jaws parallel. This bar is made in a similar manner to the bar C. The rear jaw can be fastened to the side of a bench, post, or any support that may be handy.—Contributed by Wm. S. Thompson, Columbia, Tenn.

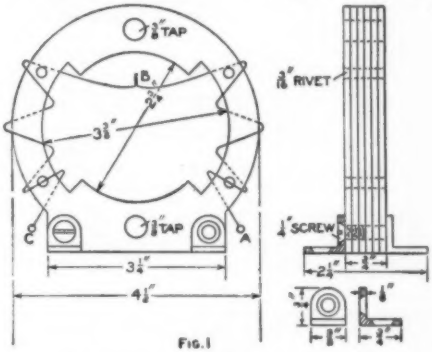
How to Make a Small Electric Motor

By W. A. ROBERTSON

The field frame of the motor, Fig. 1, is composed of wrought sheet iron, which may be of any thickness so that, when several pieces are placed together, they will make a frame ¾ in. thick. It is necessary to lay out a template of the frame as shown, making it $\frac{1}{16}$ in. larger than the dimensions given, to allow for filing to shape after the parts are fastened together. After the template is marked out, drill the four rivet holes, clamp the template, or pattern, to the sheet iron and mark carefully with a scriber. The bore can be marked with a pair of dividers, set at ⅛ in. This will mark a line for the center of the holes to be drilled with a ¼-in. drill for removing the unnecessary metal. The points formed by drilling the holes can be filed to the pattern size. Be sure to mark and cut out a sufficient number of plates to make a frame ¾ in. thick, or even $\frac{1}{16}$ in. thicker, to allow for finishing.

After the plates are cut out and the rivet holes drilled, assemble and rivet them solidly, then bore it out to a diameter of 2¾ in. on a lathe. If the thickness is sufficient, a slight finishing cut can be taken on the face. Before removing the field from the lathe, mark off a space, 3⅜ in. in diameter, for the field core with a sharp-pointed tool, and for the outside of the frame, 4½ in. in diameter, by turning the lathe with the hand. Then the field can be finished to these marks, which will make it uniform in size. When the frame is finished so far, two holes, 3⅝ in. between centers, are drilled and tapped with a ⅜-in. tap. These holes are for the bearing studs. Two holes are also drilled and tapped for ¼-in. screws, which fasten the holding-down lugs or feet to the frame. These lugs are made of a piece of ⅛-in. brass or iron, bent at right angles as shown.

The bearing studs are now made, as shown in Fig. 2, and turned into the threaded holes in the frame. The bearing supports are made of two pieces of ⅛-in. brass, as shown in the left-hand sketch, Fig. 3, which are fitted on the studs in the frame. A ⅝-in. hole is



The Field-Coil Core is Built Up of Laminated Wrought Iron Riveted Together

drilled in the center of each of these supports, into which a piece of ⅝-in. brass rod is inserted, soldered into place, and drilled to receive the armature shaft. These bearings should be fitted and soldered in place after the armature is constructed. The manner of doing this is to wrap a piece of paper on the outside of the finished armature ring and place it through the opening in the field, then slip the bearings on the ends of the shaft. If the holes in the bearing support should be out of line, file them out to make the proper adjustment. When the bearings are located, solder them to the supports, and build up the solder well. Remove

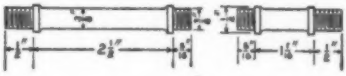


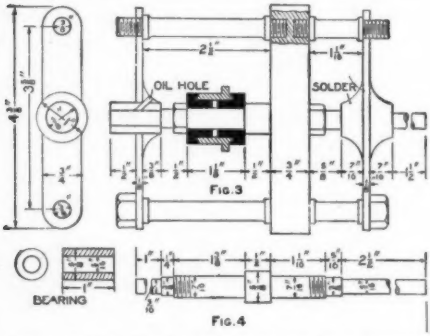
Fig. 2

The Bearing Studs are Turned from Machine Steel Two of Each Length being Required

the paper from the armature ring and see that the armature revolves freely in the bearings without touching the inside of the field at any point. The supports are then removed and the solder turned up in a lathe, or otherwise finished. The shaft of the arma-

ture, Fig. 4, is turned up from machine steel, leaving the finish of the bearings until the armature is completed and fastened to the shaft.

The armature core is made up as fol-

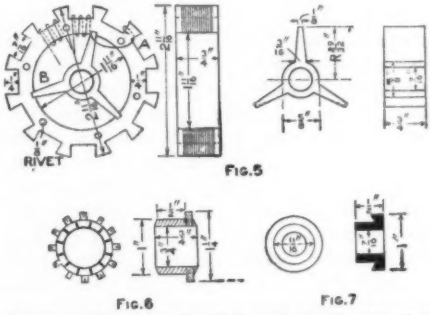


The Assembled Bearing Frame on the Field Core and the Armature Shaft Made of Machine Steel

lows: Two pieces of wrought sheet iron, 1/8 in. thick, are cut out a little larger than called for by the dimensions given in Fig. 5, to allow for finishing to size. These are used for the outside plates and enough pieces of No. 24 gauge sheet iron to fill up the part between until the whole is over 3/4 in. thick are cut like the pattern. After the pieces are cut out, clamp them together and drill six 1/8-in. holes through them for rivets. Rivet them together, and anneal the whole piece by placing it in a fire and heating the metal to a cherry red, then allowing it to cool in the ashes. When annealed, bore out the inside to 1 11/16 in. in diameter and fit in a brass spider, which is made as follows: Procure a piece of brass, 3/4 in. thick, and turn it up to the size shown and file out the metal between the arms. Slip the spider on the armature shaft and secure it solidly with the setscrew so that the shaft will not turn in the spider when truing up the armature core. File grooves or slots in the armature ring so that it will fit on the arms of the spider. Be sure to have the inside of the armature core run true. When this is accomplished, solder the arms of the spider to the metal of the armature core. The shaft with the core is then put in a lathe and the outside turned off to the proper size. The sides are also faced off and finished. Make the core 3/4 in. thick. Remove the core from the lathe and file out slots 1/4 in. deep and 7/16 in. wide.

The commutator is turned from a piece of brass pipe, 3/4 in. inside diameter, as shown in Fig. 6. The piece is placed on a mandrel and turned to 3/4 in. in length and both ends chamfered to an angle of 60 deg. Divide the surface into 12 equal parts, or segments. Find the centers of each segment at one end, then drill a 1/8-in. hole and tap it for a pin. The pins are made of brass, threaded, turned into place and the ends turned in a lathe to an outside diameter of 1 1/4 in. Make a slit with a small saw blade in the end of each pin for the ends of the wires coming from the commutator coils. Saw the ring into the 12 parts on the lines between the pins.

The two insulating ends for holding these segments are made of fiber turned to fit the bore of the brass tubing, as shown in Fig. 7. Procure 12 strips of mica, the same thickness as the width of the saw cut made between the segments, and use them as a filler and insulation between the commuta-



Armature-Ring Core, Its Hub and the Construction of the Commutator and Its Insulation

tor bars. Place them on the fiber hub and slip the hub on the shaft, then clamp the whole in place with the nut, as shown in Fig. 3. True up the commutator in a lathe to the size given in Fig. 6.

The brush holder is shaped from a

piece of fiber, as shown in Fig. 8. The studs for holding the brushes are cut from $\frac{5}{16}$-in. brass rod, as shown in Fig. 9. The brushes consist of brass or copper wire gauze, rolled up and flattened out to $\frac{1}{8}$ in. thick and $\frac{1}{4}$ in. wide, one end being soldered to keep the wires in place. The holder is slipped on the projecting outside end of the bearing, as shown in Fig. 3, and held with a set-screw.

The field core is insulated before winding with 1/64-in. sheet fiber, washers, $1\frac{1}{8}$ in. by $1\frac{1}{2}$ in., being formed for the ends, with a hole cut in them to fit over the insulation placed on the cores. A slit is cut through from the hole to the outside, and then they are soaked in warm water, until they become flexible enough to be put in place. After they have dried, they are glued to the core insulation.

The field is wound with No. 18 gauge double-cotton-covered magnet wire, about 100 ft. being required. Drill a small hole through each of the lower-end insulating washers. In starting to wind, insert the end of the wire through the hole from the inside, at A, Fig. 1, and wind on four layers, which will take 50 ft. of the wire, and bring the end of the wire out at B. After one coil, or side, is wound start at C in the same manner as at A, using the same number of turns and the same length of wire. The two ends are joined at B.

The armature ring is insulated by covering the inside and brass spider with $\frac{1}{16}$-in. sheet fiber. Two rings of $\frac{1}{16}$-in. sheet fiber are cut and glued to the sides of the ring. When the glue is set, cut out the part within the slot ends and make 12 channel pieces from 1/64-in. sheet fiber, which are glued in the slots and to the fiber washers. Be sure to have the ring and spider covered so the wire will not touch the iron or brass.

Each slot of the armature is wound with about 12 ft. of No. 21 gauge double-cotton-covered magnet wire. The winding is started at A, Fig. 5, by bending the end around one of the projections, then wind the coil in one of the slots as shown, making 40 turns, or four layers of 10 turns each, shellacking each layer as it is wound. After the coil is completed in one slot, allow about 2 in. of the end to protrude, to

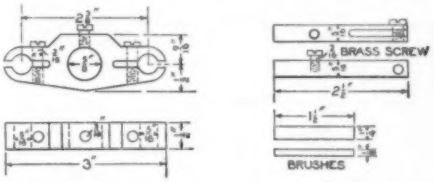


FIG. 8 FIG. 9

The Insulated Brush Holder and Its Studs for Holding the Brushes on the Commutator

fasten to the commutator segment. Wind the next slot with the same number of turns in the same manner, and so on, until the 12 slots are filled. The protruding ends of the coils are connected to the pins in the commutator segments after the starting end of one coil is joined to the finishing end of the next adjacent. All connections should be securely soldered.

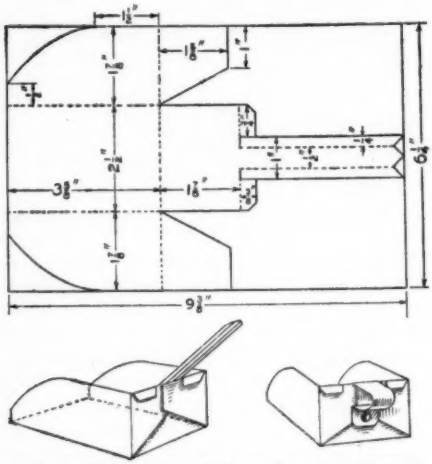
The whole motor is fastened with screws to a wood base, 8 in. long, 6 in. wide and 1 in. thick. Two terminals are fastened at one side on the base, and a switch at the other side.

To connect the wires, after the motor is on the stand, the two ends of the wire, shown at B, Fig. 1, are soldered together. Run one end of the field wire, shown at A, through a small hole in the base and make a groove on the under side so that the wire end can be connected to one of the terminals. The other end of the field wire C is connected to the brass screw in the brass brush stud. Connect a wire from the other brush stud, run it through a small hole in the base and cut a groove for it on the under side so that it can be connected through the switch and the other terminal. This winding is for a series motor. The source of current is connected to the terminals. The motor can be run on a 110-volt direct current, but a resistance must be placed in series with it.

¶ New tinware rubbed over with fresh lard and heated will never rust.

A Shot Scoop

In the ammunition department of our hardware store the shot was kept in regular square bins and dished out



A Small Square Scoop Made of Tin for Dipping Up Shot Stored in a Square Bin

with a round-bottom scoop. This was very difficult, especially when the bottom of the bin was nearly reached, as the round scoop would roll over them and only pick up a few at a time. To overcome this difficulty I constructed a square-shaped scoop that gave entire satisfaction. The scoop can be used for other purposes as well.

A thick piece of tin, 6¼ by 9¾ in., was marked out as shown, the pattern being cut on the full lines and bent on the dotted ones. The strip for the handle was riveted to the end of the scoop.—Contributed by Geo. B. Wright, Middletown, Conn.

Removing Grease Stains from the Leaves of a Book

Happening to get a grease spot on a page of a valuable book, I found a way to remove it without injury to the paper, which has been tried out several times with success.

Heat an iron and hold it as near as possible to the stain without discoloring the paper, and the grease will disappear. If any traces of the grease are left, apply powdered calcined magnesia. Bone, well calcined and powdered, and plaster of Paris are also excellent absorbents of grease.

A beautifully bound book, and quite new, had oil from a lamp spilled over it. There was no quicklime to be had, so some bones were quickly calcined, pulverized and applied. The next morning there was no trace of oil, but only an odor which soon vanished.—Contributed by Paul Keller, Indianapolis, Ind.

Tightening Cane in Furniture

Split cane, used as part of furniture, such as chair seats, often becomes loose and the threads of cane pull out. This can be prevented by sponging with hot water, or by applying steaming cloths to the cane. This process also tightens the shreds of cane and does not injure ordinary furniture. If the article is highly polished, care should be taken to prevent the hot water from coming in contact with anything but the cane.

Cleaner for a Stovepipe

A long horizontal pipe for a stove soon fills with soot and must be cleaned. The usual method is to beat the pipe after taking it down to be cleaned, but a much better device for the purpose is shown in the sketch.

A scrub brush is procured and cut in two, the parts being hinged to a crosspiece fastened to a long broom handle. The brushes are pressed outward

A Cleaning Brush to Remove the Accumulated Soot in a Long Horizontal Stovepipe

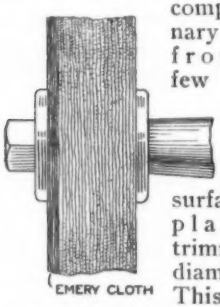
against the inside surfaces of the pipe with a wire and spring, as shown.—Contributed by C. L. Herbert, Chicago, Illinois.

Waterproofing a Wall

The best way to make a tinted wall waterproof is to first use a material composed of cement properly tinted and with no glue in it—one that will not require a glue size on the wall. After this coating of cement is applied directly to the plaster, cover it completely with water enamel and, when dry, give the surface a thorough coating of varnish. This will make a perfectly impervious covering, which steam, water or heat will not affect.—Contributed by Julia A. White, New York City.

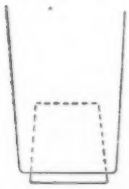
Polishing Flat Surfaces

The work of finishing a number of brass castings with flat sides was accomplished on an ordinary polishing wheel, from which the first few layers of cloth were removed and replaced with emery cloth. The emery surface of the cloth was placed outward and trimmed to the same diameter as the wheel. This made a sanding and polishing wheel in one.—Contributed by Chester L. Cobb, Portland, Maine.



Rubber Tip for Chair Legs

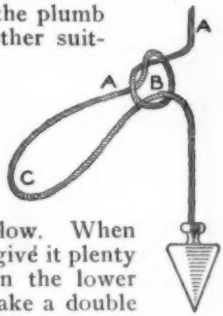
An inexpensive method of preventing a chair from scratching the floor is to bore a hole of the proper size in the bottom end of each chair leg and then procure four rubber stoppers of uniform size and press them into place.



This cushion of rubber eliminates vibrations, and they will not slip nor mar the finest surface upon which they rest.—Contributed by W. A. Jaquythe, Richmond, Cal.

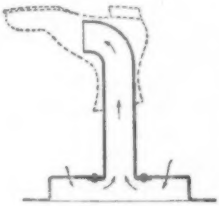
Adjusting a Plumb-Bob Line

When plumbing a piece of work, if there is no help at hand to hold the overhead line, it is common practice to fasten the plumb line to a nail or other suitable projection. On coming down to the lower floor it is often found that the bob has been secured either too high or too low. When fastening the line give it plenty of slack and when the lower floor is reached make a double loop in the line, as shown in the sketch. Tightening up on the parts A A will bind the loop bight B, and an adjustable friction-held loop, C, will be had for adjusting the bob accurately either up or down.—Contributed by Chas. Herrman, New York City.



Drier for Footwear

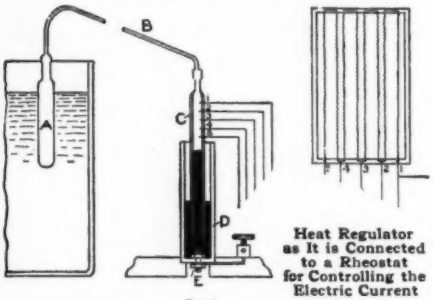
A drier for footwear can be readily made by a tinner, or anyone that can shape tin and solder. The drier consists of a pipe of sufficient length to enter the longest boot leg. Its top is bent at right angles and the other end is riveted to a base, an inverted stewpan, for instance, in whose bottom a few perforations have been made to let air in. The boot or stocking to be dried is placed over the pipe and the whole set on a heated surface. The heat will cause a rapid circulation of air which will dry the article quickly.—Contributed by Wm. Roberts, Cambridge, Mass.



¶A very satisfactory repair can be made by using a good photographic paste to fasten a torn window shade to its roller.

Automatic Electric Heat Regulator

It is composed of a closed glass tube, A, Fig. 1, connected by means of a very small lead pipe, B, to another



Heat Regulator as It is Connected to a Rheostat for Controlling the Electric Current

Fig. 1

glass tube, C, open at the bottom and having five pieces of platinum wire (1, 2, 3, 4 and 5), which project inside and outside of the tube, fused into one side. This tube is plunged into an ebonite vessel of somewhat larger diameter, which is fastened to the base by a copper screw, E. The tube C is filled to a certain height with mercury and then petroleum. The outer ends of the five platinum wires are soldered to ordinary copper wires and connections made to various points on a rheostat as shown. The diagram, Fig. 2, shows how the connections to the supply current are made.

The apparatus operates as follows: The tube is immersed in the matter to be heated, a liquid, for instance. As

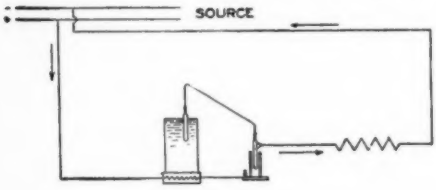


Fig. 2

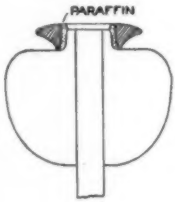
Wiring Diagram Showing How the Connections to a Source of Current Supply are Made

the temperature of this rises, the air expands and exerts pressure on the petroleum in the tube C so that the level of the mercury is lowered. The current is thus compelled, as the platinum wires with the fall of the mercury are brought out of circuit, to pass through an increasing resistance, until, if necessary, the flow is entirely stopped when the mercury falls below the wire 5.

With this very simple apparatus the temperature can be kept constant within a 10-deg. limit, and it can be made much more sensitive by increasing the number of platinum wires and placing them closer together, and by filling the tube A with some very volatile substance, such as ether, for instance. The petroleum above the mercury prevents sparking between the platinum wire and the mercury when the latter falls below any one of them.

Repairing a Washer on a Flush Valve

When the rubber washer on the copper flush valve of a soil-basin tank becomes loose it can be set by pouring a small quantity of paraffin between the rubber and the copper while the valve is inverted, care being taken to have the rubber ring centered. This makes a repair that will not allow a drop of water to leak out of the tank.—Contributed by Frank Jermin, Alpena, Michigan.



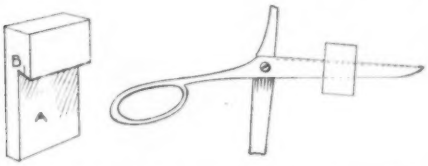
Cleaning Discolored Silver

A very quick way to clean silver when it is not tarnished, but merely discolored, is to wash the articles in a weak solution of ammonia water. This removes the black stains caused by sulphur in the air. After cleaning them with the solution, they should be washed and polished in magnesia powder or with a cloth. This method works well on silver spoons tarnished by eggs and can be used every day while other methods require much time and, therefore, cannot be used so often.

Sharpening Scissors

When sharpening scissors on a grindstone it is very difficult to procure a straight edge. For those not having the facilities of a grinding arrangement a very handy device that will produce a straight and sharp edge can be easily constructed as follows:

Procure a block of wood, 1½ in. long, 1 in. wide and ½ in. thick, and saw a kerf square with the face of the block, as shown at A. Attach a piece



A Block of Wood Fitted with a Piece of Emery Cloth for Sharpening Scissors Correctly

of fine emery cloth in the kerf, at B, with glue, taking care to have it flat on the sloping surface only and allowing no part of the cloth to turn the sharp corner and lie on the back side. Apply the block to the scissor blade as shown and draw it back and forth from one end to the other, being careful to keep the back side of the blade flat against the block. Without being familiar with scissors grinding, anyone can sharpen them correctly with this block. —Contributed by Harriet Kerbaugh, Allentown, Pa.

Counter Brush for a Shop

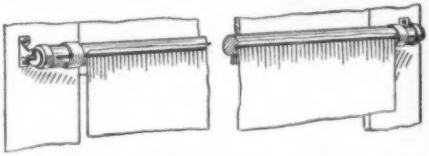
A very serviceable brush for use around a shop can be made from a discarded or worn-out push broom as shown at A. Pull out the bristles from one-half of the brush and shape the wood of that end with a knife or

A Discarded Push Broom Shaped to Form a Brush for the Bench or Counter

spokeshave to the form of a handle, and the brush will be formed as shown at B.—Contributed by James T. Gaffney, Chicago.

A Curtain Roller

Procure a window-shade roller, an umbrella rib and two strips of oilcloth, each 1 in. wide and 4 in. long. Cut the

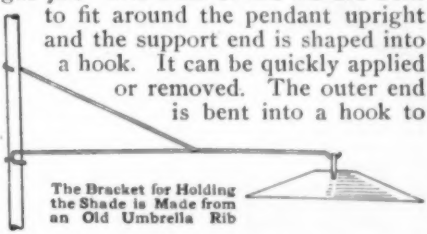


The Curtain is Easily Attached to and Detached from the Roller for Cleaning

roller off so that it will be 6 in. longer than the distance across the window, then cut a groove in it to insert the rib. Sew the pieces of oilcloth so that they will just fit over the ends of the roller. When this is done lay the curtain across the groove, then press the rib and curtain into the groove and push the oilcloth bands over the ends of the rib to keep it in place.—Contributed by E. L. McFarlane, Nashwaakees, N. B.

Shade-Holder Bracket for a Gas Jet

An old umbrella rib makes a very effective shade-holder bracket for a gas jet. The ends of the rib are bent to fit around the pendant upright and the support end is shaped into a hook. It can be quickly applied or removed. The outer end is bent into a hook to



The Bracket for Holding the Shade is Made from an Old Umbrella Rib

hold the shade. The rib can be cut to fit a pendant arm of any length.—Contributed by Edward Keegstra, Paterson, N. J.

To Longer Preserve Cut Flowers

A good way to keep cut flowers fresh is to place a small amount of pure salt of sodium in the water. It is best to procure this salt at a drug store because commercial salt will cause the flowers to wither, due to the impurities in the soda. Call for pure sodium chloride.

Fig. 1

Fig. 3

Fig. 5

Fig. 7

Fig. 9

PATENTS, PRACTICAL OR UNIQUE

STRAIGHT-STEERING ATTACHMENT FOR MOTORCYCLES (Fig. 1; British patent)—This tension spring device, attached to the forks and to some part of the frame of the motorcycle or bicycle, exerts a check on the movement of the forks when the machine is traveling over rough roads.

DETACHABLE PNEUMATIC SOLES AND HEELS (Fig. 2; British patent)—Pneumatic treads that may be detached or put on in a few moments are here shown. The shoe has a recess around the upper edge of its ordinary sole and heel to take the wire rim of the pneumatic sole and heel.

DOUBLE - PARACHUTE ARRANGEMENT FOR AIRMEN (Fig. 3)—An airman's parachute provided with a small auxiliary parachute is here shown in operation. When the aeroplane falls, the small parachute, which is self-opening, is expected to bring the main parachute into operative position over the airman.

COMBINATION RAKE AND FORK (Fig. 4)—This garden tool is used as a rake to gather up grass, weeds and other refuse, and then as a pitchfork in the removal of the pile.

COMBINED TONGUE CLEANER AND TOOTHBRUSH (Fig. 5; British patent)—A pad for cleaning the tongue is formed of rubber having a file surface on the handle of the toothbrush. The tongue-cleaning pad may also be formed of bone, celluloid, wood, or the like.

ICE-CREAM-CONE HOLDER (Fig. 6)—The neighborhood ice-cream store is besieged during warm weather for ice-cream cones by purchasers who do not wish just one cream-filled cone to be eaten on the spot, but several, to take home. To accommodate this kind of trade one confectioner has invented these cone holders, which are themselves cone-shaped, and are provided with a wire handle terminating in a loop which may be slipped over the finger. Provided with such holders, a dozen cones may be carried home safely.

POCKET-BOOK POWDER PUFF (Fig. 7)—Just where and how to carry the powder puff is often a problem. One way of solving it is here illustrated. When closed, this powder puff has the appearance of an ordinary purse, and may be carried in the pocket or hand bag without powdering everything it comes in contact with.

FOLDING TABLE (Fig. 8)—By pulling out the legs of this convertible article of furniture a substantial table is formed. In the folded position it takes up but little space and may be used, if desired, as shelves for articles of one kind or another.

AN AUTO-WHEEL CLEANING BRUSH (Fig. 9)—This brush is shaped for quick and effective cleaning of automobile wheels. Its curved end enables the user to remove dirt from the spokes, brake drum, and parts of the under frame. This round end is comparatively narrow, so that places inaccessible with the ordinary brush can be reached.

WHEEL GUARD AND OBSTRUCTION REMOVER (Fig. 10; British patent)—Although not appearing to be particularly practical, this guard or obstruction remover, designed for the front wheels of automobiles, is of interest. When not in use it is held in a position above the wheel by an attachment, which, when released by means of a lever, allows the fender to fall. A roller is provided for it to run upon when in operative position.

AN INGENIOUS SHAVING BRUSH (Fig. 11)—The difficulty of keeping the ordinary shaving brush in sanitary condition has caused one inventor to devise a brush that may be unrolled,

Fig. 2

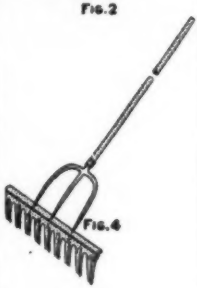


Fig. 4

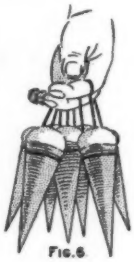


Fig. 6

Fig. 8

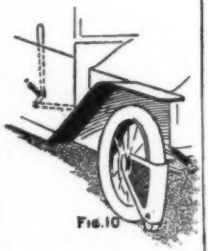


Fig. 10

Fig. 11

forming a strip of bristles not unlike a curtain fringe in appearance. The unrolled bristles may be washed by hand or machinery, then dried and ironed like an ordinary pocket handkerchief, after which it is again rolled up to form a lathering brush.

PNEUMATIC SADDLE REST (Fig. 12; British patent)—A method of using pneumatic balls as well as springs for the mounting of a motorcycle saddle is here shown. The initial compression of the springs and pneumatic balls may be regulated by turning the thumbscrews. The balls are held in place by means of cups.

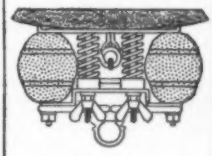


Fig. 12

WOOD-KNOB LATCH (Fig. 13)—The necessity of metal fittings on doors often spoils the artistic value of fine interior woodwork. Here is a new wood-knob door latch of which nothing shows on the outside but the knob.

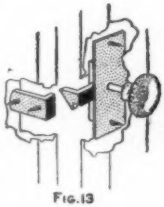


Fig. 13

SHEET-MUSIC TURNER (Fig. 14)—This pneumatic device for turning sheet music is so designed that the person undertaking this service for the pianist may stand out of the way. Pressure on the bulb operates a piston and swings metal rods attached to the sheets of music by means of clips. Release of pressure on the bulb serves to return the piston for the next turning operation.

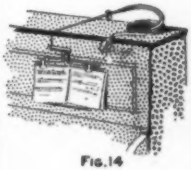


Fig. 14

ANTISKIDDING CHAIN OF NEW DESIGN (Fig. 15)—In this antiskidding device the chain is used only as a supporting means for the skid-preventing balls, which, in ordinary running, are merely carried by the tire and are under no pressure. Side friction, however, exerts a side pull on the chains, drawing the balls on one side or the other toward the road contact of the tire, thus jamming them into the tire and preventing further skidding.

Fig. 15

A SUPPORT FOR THE FISHING ROD (Fig. 16; British patent)—The shoulder strap terminates in a cup adapted to receive the handle end of the fishing pole, and a loose-end strap is provided with a hook to engage the pole and hold it in position. The device leaves the fisherman's hands free to remove his catch from the hook and put on new bait.

Fig. 16

SAFETY FUSE PULLER (Fig. 17)—This non-shock fuse puller comprises an insulating handle with an adjustable tong grip. It is claimed that with this tool a fuse can be pulled or put in "hot" while the operator is standing in a damp or conductive place with as much safety as if he were standing on a glass-insulated platform. The movable crosspiece permits a firm grasp to be taken on the fuse cylinder.

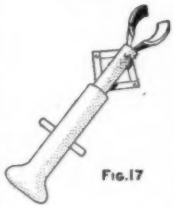


Fig. 17

FLOOR-SCRUBBING MACHINE (Fig. 18)—The brush arrangement of this machine is said to be such that the floor may be almost as conveniently scrubbed in corners as in the middle of the room. The water is fed to the brushes through a row of sprinkler perforations running lengthwise of the tank.

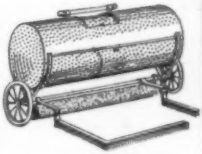


Fig. 18

A "SHOCKING" BURGLAR ALARM (Fig. 19)—This burglar alarm, which is of a complicated and "fearsome" design, will probably shock the person whose house it is designed to protect more than it will the burglar. Over the head of the bed is a sprinkler, which discharges a shower of cold water over the face and head of the sleeper when the window is raised or the door opened.

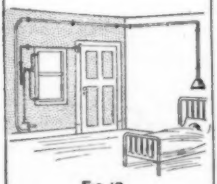


Fig. 19

AUTOMATIC TIRE PUMP (Fig. 20)—This tire-inflating air pump, designed to be driven by the flywheel of the motor, or, if the flywheel is inclosed, by a gear and slip gear on some exposed shaft, such as the pump shaft or magneto shaft, automatically stops pumping when the pressure in the tire reaches the proper limit. When used in connection with the flywheel it takes its power through a leather-faced conical disk or wheel, which is brought into contact with the flywheel by pulling a lever.

Fig. 20

A PSYCHOLOGIST came upon a hard-working Irishman toiling, bareheaded, in the street. "Don't you know," said the psychologist, "that to work in the hot sun without a hat is bad for your brains?" "D'ye think," asked the Irishman, "that Oi'd be on this job if Oi had any brains?"

◆ ◆ ◆

It was a beautiful evening and Ole, who had screwed up courage to take Mary for a ride, was carried away by the magic of the night:

"Mary," he asked, "will you marry me?"

"Yes, Ole," she answered softly.

He lapsed into silence that at last became painful to his fiancee.

"Ole," she said, desperately, "why don't you say something?"

"Ay tank," Ole replied, "they bane too much said already!"—San Francisco Standard.

◆ ◆ ◆

Father—That looks like an Italian ship.

Son—Papa, don't you think it's awful kind of us to let the other nations use our ocean?—Collier's Weekly.

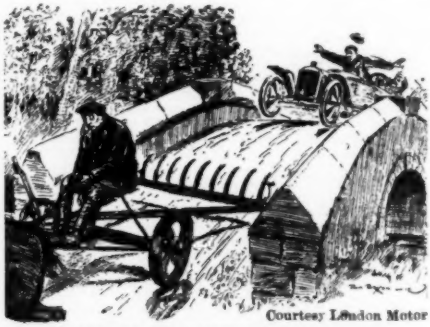
◆ ◆ ◆

Jack McGee comes up from Florida with an account of what happened when the circus train went bump in the woods down there and the Old Man offered the surrounding niggers a dollar each for bringing the animal specimens back. The price was not good enough for one gigantic and gorilla-made speculator, who wanted it doubled for a giraffe he said he had hived back-a-ways. The Old Man hadn't missed any giraffe, but he was willing to find out about it. He asked the gorilla if he was sure he knew what he was talking about. He was.

"Yassuh, Ah is, 'n it's a mighty savage giraffe, too. Done bite me twice in de laig. Ah ain' fetchin' no giraffe in fo' no dollah. Swuff two."

The Old Man gave him a dollar down and promised another on delivery of the goods. He took it and went away.

Next morning he came in, looking as though some one had been cleaning fish on him—lacerated, bloody and lame. In one hand he carried a club the size of your leg. In the other, over his shoulder, was one end of a rope. At the other end of the rope, battered, half hairless, limp and utterly dejected, dragged a ten-foot royal Bengal man-eating tiger.—Will Eaton in Press Club Scoop.



Courtesy London Motor

A MODERN HORATIUS AT THE BRIDGE

"But those behind cried 'forward!' and those before cried 'back!'"

—Lays of Ancient Rome

◆ ◆ ◆

Years ago a former United States Senator from one of our Western States was foreman of a gang of lumberjacks, mostly Swedes. One day he had three or four with him on a raft.

"You better gat some one to tak Ole's plaise," one of the men addressed him.

"What's the matter with Ole?"

"Hae yost went under the raft and I tank hae's not coming back."

◆ ◆ ◆

Ernest Thompson-Seton said, "I asked a little boy in one of my camps to tell me something wonderful about birds.

"'Why,' said the little boy, 'how they come out of the eggs, that's wonderful.'

"'Now,' I went on, 'tell me something about them more wonderful still.'

"'Why,' he answered, 'it's more wonderful how they ever got inside the eggs.'"—Cincinnati Enquirer.

Pat and Mike were crossing the Delaware River on a ferryboat. They were watching intently a big dredging barge that was sending its mammoth scoops under the water and bringing up tons of mud.

"Pat," says Mike, "wouldn't yez loike to be a-workin' over there on thot mud-digger?"

"Yis," says Pat, "but begorra, Oi'd hate to be one of the fellows under the water that's fillin' up thim shovels."—San Francisco Examiner.

◆ ◆ ◆

Farmer (seeing a street sprinkler for the first time)—These city folks certainly are smart. Look what that fellow has fixed at the back of his wagon to keep the boys from stealing a ride!

◆ ◆ ◆

The Hotel Clerk (suspiciously, to prospective guest, whose bag has come apart, thereby disclosing a strange contrivance)—May I ask what that queer thing is?

The Prospective Guest—This is a new patent fire-escape. If your hotel caught fire, I could let myself down from the window so easily—see?

The Hotel Clerk—Exactly; our terms for guests with fire escapes are invariably cash in advance.—The Sketch.

◆ ◆ ◆

A lawyer was cross-examining an old German about the position of the doors, windows, and so forth, in a house in which a certain transaction occurred.

"And now, my good man," said the lawyer, "will you be good enough to tell the court how the stairs run in the house?"

The German looked dazed and unsettled for a moment. "How do the stairs run?" he queried.

"Yes, how do the stairs run?"

"Vell," continued the witness, after a moment's thought, "ven I am oopstairs dey run down, and ven I am downstairs dey run oop."—Everybody's

◆ ◆ ◆

Tommy came out of a room where his father was tacking down a carpet. He was crying lustily.

"Why, Tommy, what's the matter?" asked the mother.

"P-p-p-papa hit his finger with the hammer," sobbed Tommy.

"Well, you needn't cry about a thing like that," comforted his mother. "Why didn't you laugh?"

"I did," sobbed Tommy.

◆ ◆ ◆

A country school teacher was cashing her monthly check at the bank. The teller apologized for the filthy condition of the bills, saying, "I hope you are not afraid of microbes."

"Not a bit of it," the schoolmarm replied. "I'm sure no microbe could live on my salary."—Lippincott's.

◆ ◆ ◆

For a whole solid hour the captain had been lecturing his men on "The Duties of a Soldier," and he thought that now the time had come for him to test the results of his discourse.

Casting his eyes around the room, he fixed on Private Murphy as his first victim.

"Private Murphy," he asked, "why should a soldier be ready to die for his country?"

The Irishman scratched his head for a while; then an ingratiating and enlightened smile flitted across his face.

"Sure, captain," he said pleasantly, "you're quite right. Why should he?"—Philadelphia Inquirer.

All These FREE!

Present this coupon to your paint or hardware dealer for our 25-cent Instruction Book. He will also give you free two 10-cent bottles of Johnson's Wood Dye, which comes in 17 shades, such as Mission Oak, Early English, Mahogany, etc., and one 10-cent can of Johnson's Prepared Wax. Our book tells how to secure the right artistic wood effects with least expense and trouble.

Johnson's Wood Dye

is a *dye,* not a stain. It sinks deep down bringing out the natural beauty of the wood. In half an hour it will be perfectly dry. No dust sticks, no streaks show. Not only beautiful but lasting and easy to use. May be applied over old worn varnish or shellac.

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a *perfect furniture polish* and finish for all woodwork, floors, and furniture, including pianos. Can be used over all finishes. Is beautifying and protecting. Our book tells how to apply it over any wood—new or old. Get the book and 10c packages free from your dealer.

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but he could not supply me—so please send postpaid.

Name .....

Address .....

City ..... State .....

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The Winged Message

Noah's messenger was a dove. In Solomon's time, pigeons were trained to carry messages. Brutus used them at the siege of Modena. They served the Turks in their fights against the Crusaders. In mediæval wars they were more useful than ever before.

France had a carrier-pigeon mail service, with messages reduced by photography and read through a microscope.

Even today carrier pigeons are utilized as news-bearers in isolated parts of Europe.

In America, the land of the telephone, the carrier pigeon is bred only for racing. The winged word has taken the place of the winged messenger.

Pigeons may fly more than a mile a minute, but the telephone is as quick as speech itself.

The dove is the emblem of peace. The telephone is the instrument of peace. The telephone lines of the Bell System unite a hundred million people in one national family.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES

One Policy ***One System*** ***Universal Service***

EXTRA! EXTRA!

68,570 "Baby Grand" Inquiry Letters Burned!

If Your Letter Was Among Them—WRITE AGAIN, AT ONCE

The fire, which on February 13, destroyed the General Offices of the Brunswick-Balke-Collender Company in Chicago, swept away all the accumulated correspondence and card records resulting from our advertising of BRUNSWICK HOME BILLIARD AND POCKET-BILLIARD TABLES in this and other publications. While the fire destroyed all correspondence relating to the "BABY GRAND" and other styles of Home Billiard Tables, *our factory facilities were untouched.* We have nine factories and 60 branch houses, with complete stocks of all sizes and styles of Brunswick Tables.

In order to avoid confusion and delay, we ask all who have already corresponded with us to WRITE AGAIN, AT ONCE. We are now established in new General Offices and are equipped to transact business with our customary promptness.

THE BRUNSWICK-BALKE-COLLENDER CO.

Play HOME BILLIARDS On the "BABY GRAND"

Billiards holds the scepter of supremacy over all indoor games for the home. It affords the delightful combination of physical exercise, mental relaxation, excitement and *fun* for young and old. *Real billiards* can only be played on a *real* billiard table. You can now secure, *in home sizes,* the famous Brunswick tables, used exclusively by the billiard experts of the world.

The Brunswick "BABY GRAND" is the world's finest Home Billiard Table. Genuine mahogany, inlaid design, highly finished. Celebrated Baby Monarch cushions. Vermont slate bed. Concealed drawer holds complete playing equipment.

The "Baby Grand" is furnished either as a Carom or Pocket-Billiard Table or as a combination Carom and Pocket-Billiard Table, as desired.

Our Brunswick "Convertible" Billiard or Pocket-Billiard Tables serve also as Dining and Library Tables or Davenports. Excellent playing qualities.

Send Coupon for Illustrated Circular

Circular accurately describes and illustrates *in full colors* the many styles and sizes of Billiard and Pocket-Billiard Tables designed for the home. Gives special prices and full details of Easy-Payment Proposition.

THE BRUNSWICK-BALKE-COLLENDER CO.

Nine Factories and 60 Branch Houses

Dept. E W, Harrison St. and Wabash Ave., Chicago

The World's Famous "BABY GRAND"

Over a Year to Pay! Full Playing Outfit Free

Play while you pay! Our low prices and easy terms bring Brunswick Tables within reach of all who love the game. Complete Playing Equipment and all accessories furnished free with each table. Outfit includes cues, balls, bridge, rack, markers, rules and book, "How to Play."

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Gentlemen: Please send to the address below, Illustrated Circular of Brunswick Home Billiard Tables.

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Address _____

Town _____ *State* _____

(If you have already corresponded with us, please write, giving full details)

(84)

No-Rim-Cut Tires

Our Average Profit $2.90 Per Tire

Goodyear tires, according to size, sell all the way from $15.55 to $104.95.

The popular size—34x4—costs you from $32.95 to $37.90, according to type and tread.

And our average profit last year, all sizes considered, was exactly $2.90 per tire. In getting at this we figure no interest on millions of capital invested.

Why We Tell It

This is something unusual—this telling of profit. But we know of no better way to show you exactly the value you get in these tires.

That's half of the tire question—the actual money which goes into work and materials.

Tires could be made at half our cost which would look as good as Goodyears. The material cost depends entirely on the maker's standard. So does your cost per mile.

We Never Skimp

Goodyears are built without regard to expense, to give you the utmost mileage.

We learn what is best by countless comparisons made on tire testing machines.

Thus we have tested some 240 formulas and fabrics. We wore the tires out and metered the mileage.

Then we adopted that formula and fabric which cost the least per mile—no matter what it cost per tire.

That's what you get in every Goodyear tire. And we get for our service and capital just $2.90 over cost, averaging all the sizes.

Lowest Making Cost

We build more tires, by long odds, than any other plant in the world. And our factory is equipped with the latest machinery, much of our own invention.

Thus production cost is brought to the minimum, type and worth considered.

Nearly all that we get for a tire, therefore, goes into things that count.

That's how you get, at the Goodyear price, tires that can't be rim-cut—tires 10 per cent oversize.

What we cut from our profit goes into these things. What we save by efficiency goes there. And those two features, on legions of cars, have cut tire bills right in two.

In view of these facts, can you think any tire offers more real value than you get in a Goodyear tire? Can anyone serve you more efficiently? Will anyone take less profit?

10% Oversize

Fortunes Are Spent to Improve Them

Here's another side to tire making which consists of dead expense.

We maintain a laboratory for chemical research. Also a large experimental department.

Half a hundred men—mostly technical graduates—are here seeking ways to better Goodyear tires.

Here tires are destroyed on tire testing machines to prove out formulas and methods. Here materials are analyzed. And scores of trained minds here are constantly thinking how to add to Goodyear mileage.

$100,000 Per Year

These departments cost us about $100,000 per year. Yet that will mean, on this year's probable output, only five cents per tire.

Five cents per tire to guard all the materials, and to constantly lessen your tire bills.

For a good many years we've been doing this for you. And you find the result in Goodyear tires of today.

Outsell All Others

Now note the result, after two million Goodyears have told men what they do.

These tires by far outsell all other tires. And the demand for Goodyears has grown like an avalanche as the facts about them spread.

Last year's sale by far exceeded our previous 12 years put together. And the demand from users this year is running twice as large as last.

Consider this fact, then consider how men are now keeping track of tire mileage. These are days of odometers—days when men know the service that tires are rendering.

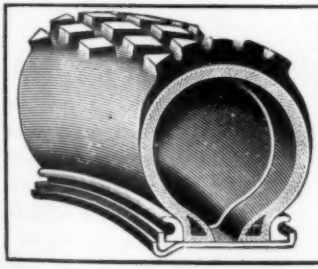
It was under these conditions, mark you, that Goodyear tires came to outsell others.

And you, like the rest, want tires that can't rim-cut, tires 10 per cent over-size.

You want tires built by the mileage test, as Goodyear tires are built. You want tires sold at a minimum profit, as Goodyear tires are sold.

Then ask for Goodyear No-Rim-Cut tires. Make your tests as others have made them. You will then adopt these tires, as hundreds of thousands have done. And your tire upkeep will drop to minimum.

Write for the Goodyear Tire Book—14th-year edition. It tells all known ways to economize on tires.



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With or Without Non-Skid Treads

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In 1918—What?

By R. E. Olds, Designer

Many a car will run well for a summer. But how will it run in five years from now? And what will it cost in the meantime?

Those are the main questions in motor car buying. It is the second summer that shows up a poor car. But it may take five seasons to really prove out a good one.

For 26 years men have used cars of my building. And thousands of these men know how my cars perform after five years or more of use.

Reo the Fifth is my latest car. But all its prestige is based on ancient experience. My cars today are judged mainly by records, covering many years.

And because of those records, this factory of ours rarely catches up with its orders.

What I Know

I know that steel, unless proved by analysis, often falls short of requirements. So we analyze each lot twice.

I know that gears can't be properly proved with a hammer. So we use a 50-ton crushing machine.

I know that all driving parts should have big over-capacity. So we add 50 per cent margin of safety.

I know that steel castings often have flaws. So in Reo the Fifth we use 190 drop forgings. They cost twice what castings cost.

I know that ball bearings often fall down. So we use in this car 15 roller bearings. Common ball bearings would cost one-fifth as much.

I know that oversize tires mean enormous economy. So we use tires 34x4.

A carburetor should be doubly heated. So we use hot air and hot water both.

We use a $75 magneto.

A costly centrifugal pump.

Radical Tests

I know that we can't be too cautious. So every car gets countless tests and inspections. We discard any part for the slightest shortcoming.

Each engine is given five radical tests, lasting for 48 hours.

Important parts are hand-fitted. They are ground over and over until we get utter exactness. We limit our output to 50 cars daily, so our men are never hurried.

As a result, every Reo the Fifth goes out a perfect car.

Rough-Road Cars

All these extremes add about $200 to the necessary cost of each car. They probably save, on the average, $500 during the life of the car.

They save in tire upkeep, in repairs and replacements. And they keep a car running as well as new after years and years of use.

There is no other way to make a car fit for use on American roads. One must have big brakes, big springs, big tires. One needs immense overcapacity. Drop forgings, roller bearings, tested materials — all these things are needed.

I would never buy a car built otherwise, so I shall never build one.

Our One-Rod Control

In Reo the Fifth, all the gear shifting is done by one center rod, placed out of one's way. It is done by moving this rod only three inches in each of four directions.

There are no levers, side or center. Both brakes are operated by foot pedals. So both front doors are clear. And this car, like all leading cars, has the left side drive.

This simple control is immensely desirable. See how much it means.

This car has a 17-coated body, luxurious upholstering of genuine leather, electric lights, nickel trimmings.

The extra cost of our hidden parts is made up by factory efficiency. We build all our own parts. We build only one model. That fact alone saves us 20 per cent.

That's why a car built as we build it can be sold at the Reo price. It offers unmatchable value.

Sold by a thousand dealers. Write for our 1913 catalog and we'll direct you to the nearest show-room.

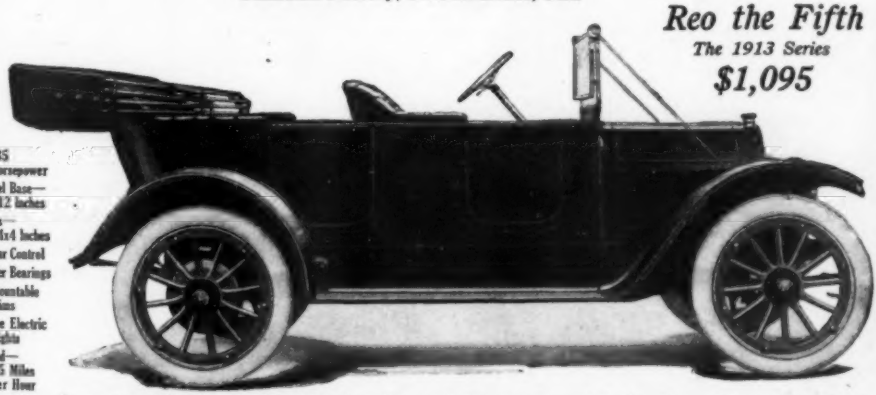
R. M. Owen & Co. General Sales Agents for **Reo Motor Car Co., Lansing, Mich.**

Canadian Factory, St. Catharines, Ont.

Reo the Fifth

The 1913 Series

$1,095



30-35 Horsepower
Wheel Base—112 Inches
Tires—34x4 Inches
Center Control
Roller Bearings
Demountable Rims
Three Electric Lights
Speed—45 Miles per Hour
Made with 5 and 2 Passenger Bodies

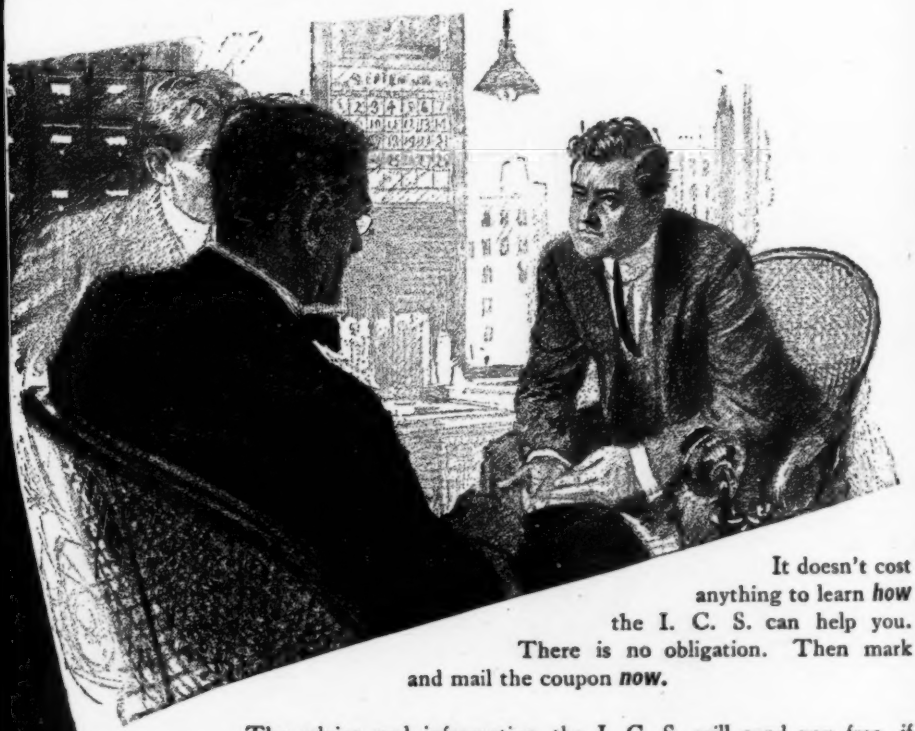
Top and windshield not included in price. We equip this car with mohair top, side curtains and slip cover, windshield, gas tank for headlights, speedometer, self-starter, extra rim and brackets — all for $100 extra (list price $170).

Gray & Davis Electric Lighting and Starting System at an extra price, if wanted. (168)

Are You A Live Wire

In every establishment there are a few men in the "thick" of things, who do the planning. In the ***thin*** of things and trailing off into nowhere are the many who fill the ordinary jobs and who cut but very little figure in the place. ***You*** are in either the ***thick*** or ***thin*** of things. If in the thin, ***switch***—you ***CAN.***

Mark and mail the attached coupon and learn how the International Correspondence Schools can help you become an expert in your ***chosen occupation.*** Doesn't matter who or what you are, where you live, what you earn, or what little schooling you have had, the I. C. S. ***can*** help you.



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Refrigeration Engineer	English Branches
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Mine Superintendent	Poultry Farming
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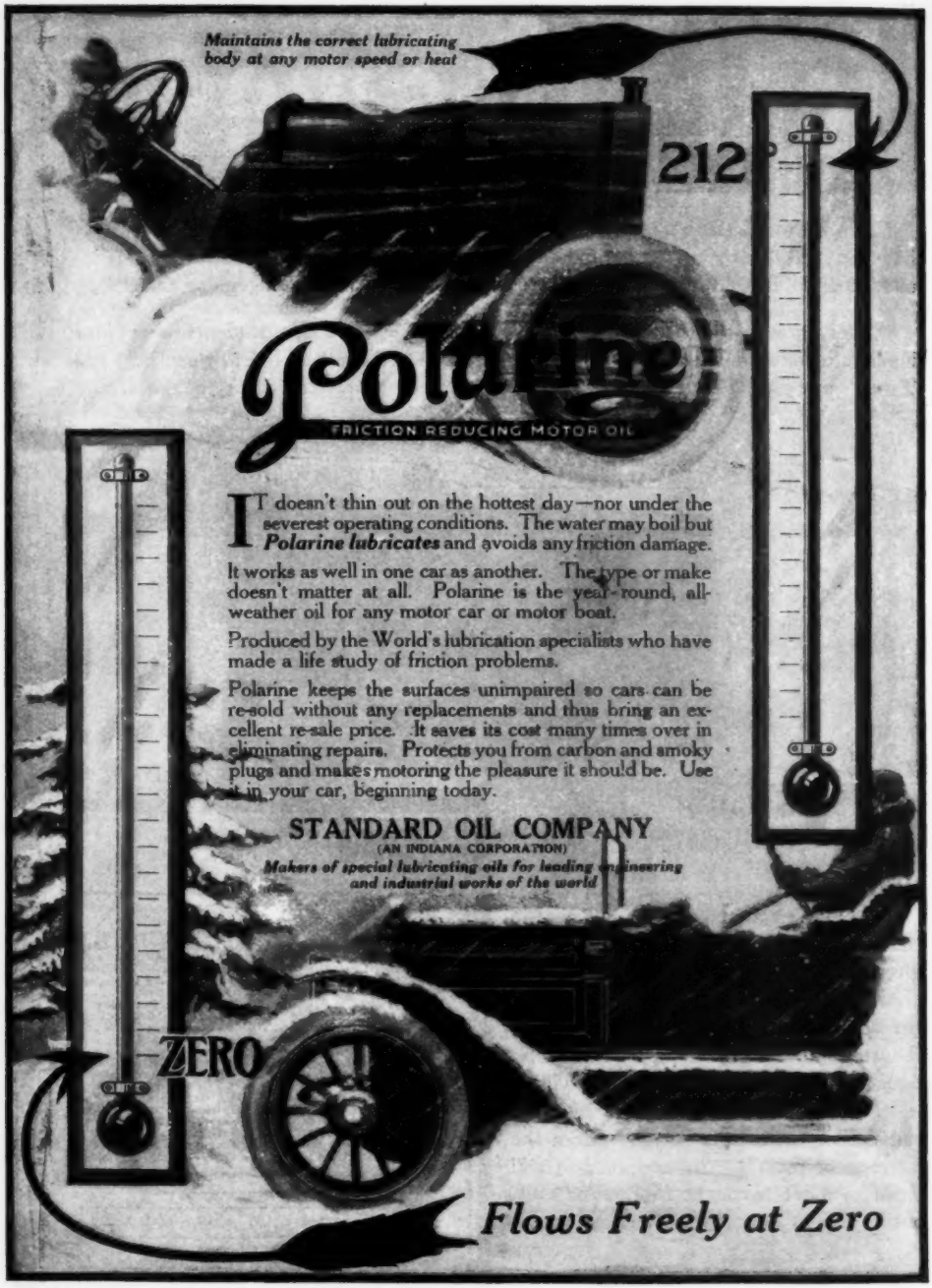
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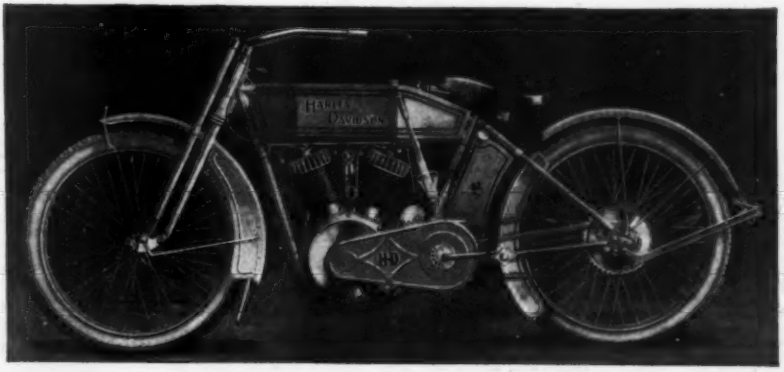

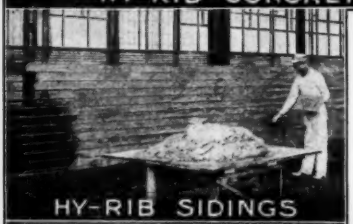

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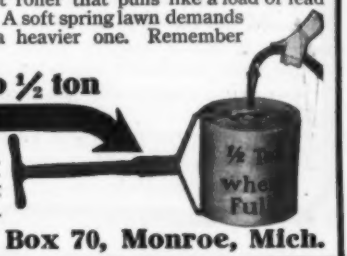

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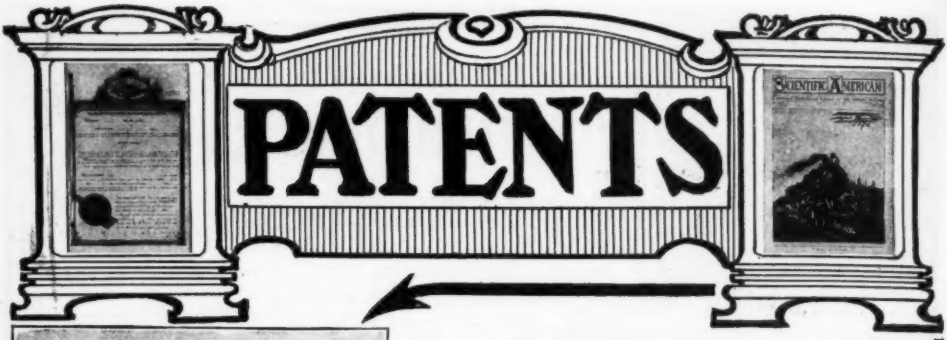

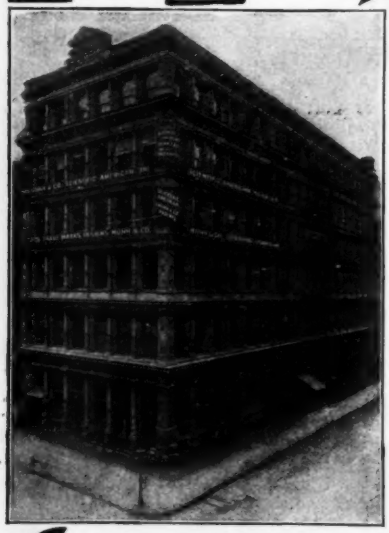

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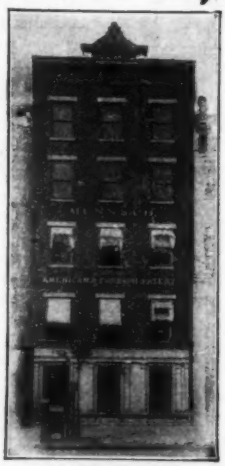

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$12.50 Per Month And the Celebrated Arrow Motorcycle Is YOURS

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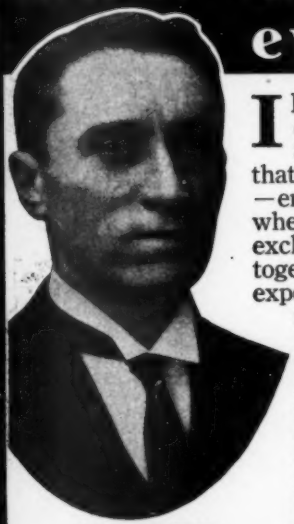

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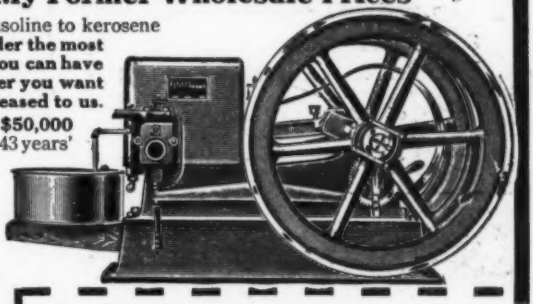

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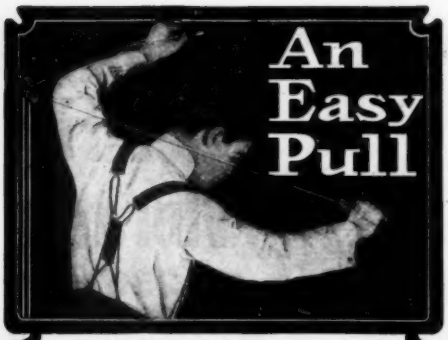

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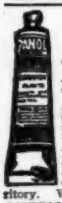

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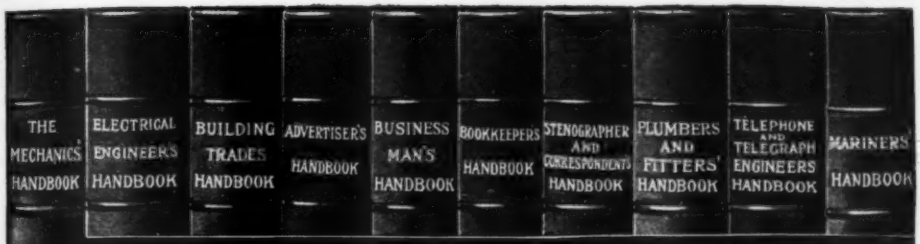

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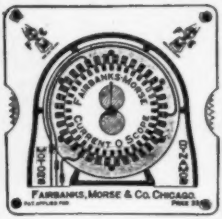

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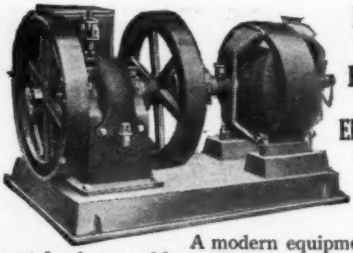

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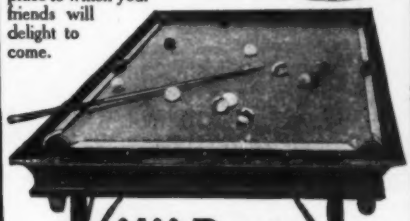

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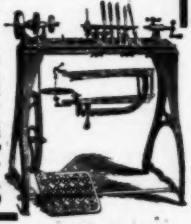

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THE FLOATING WATER-POWER PLANTS OF ITALY—One of the interesting sights on the River Po, in Italy, are the old floating water-power plants. The mills, comprising a water wheel mounted between two small barges, called "sandoni," are completely covered over and look like hump-backed Noah's Arks, being painted as brilliantly as German toys. The mills are not only painted in the gayest colors, but adorned with religious paintings and designs.

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EXPERIMENTAL AND LIGHT MACHINE WORK to order.
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UNION MODEL WORKS (Established 1882) 119 S. Clark St., CHICAGO
The oldest, most reliable, most efficient model making and experimental house in the west

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$75 Screw Cutting Foot or Power — 9 to 13 inch

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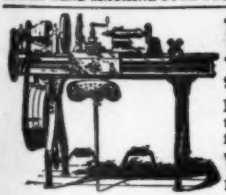

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List price $75 and up according to size. When ready to buy send for Lathe Catalog and prices.

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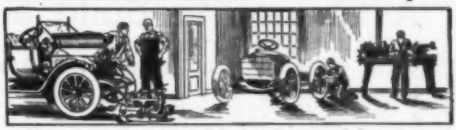

Many a good paying job has to be turned down because a shop is not equipped with a lathe to do the work. Are you in this class? If so, ***buy one of our lathes and be ready for the man with the lathe job.***

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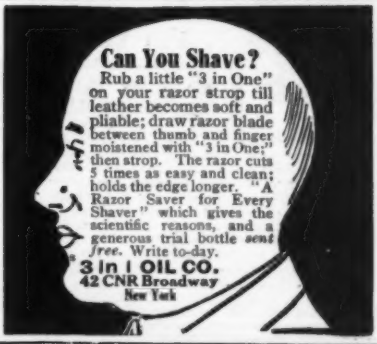

Rub a little "3 in One" on your razor strop till leather becomes soft and pliable; draw razor blade between thumb and finger moistened with "3 in One;" then strop. The razor cuts 5 times as easy and clean; holds the edge longer. "A Razor Saver for Every Shaver" which gives the scientific reasons, and a generous trial bottle *sent free.* Write to-day.

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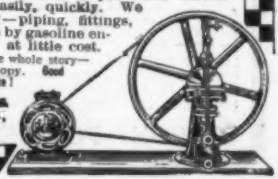

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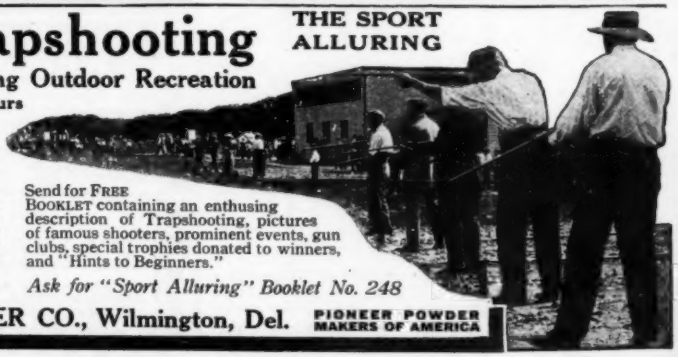

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for the work on which rests the reputation of the plant. They know these tools are always reliable. If a Starrett says so, it's right.

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good, bad and indifferent bills that go over from session to session without action by Congress. "This room is the graveyard of a thousand hopes," says the R. F. D. News. "In it are measures that mean poverty or prosperity to individuals; stagnation or activity to cities; honor or dishonor to the half-forgotten names of men who fought in years gone by. In this narrow room, which is barely half the size of a dairy-lunch room, are bills which, if passed in their entirety, would cause the few remaining hairs on the heads of several justices of the Supreme Court to rise in mortal horror and agony."

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sews leather, canvas, shoes—anything, heavy or light. Complete repair shop in itself. Saves many trips to town. Mends harness, saddles, wagon covers, blankets, buggy tops belts etc. Can t get out of order. Original and only awl with diamond point full grooved needle to protect the thread. BIG MONEY FOR AGENTS

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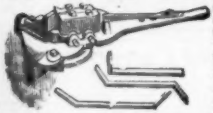

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Takes No. 18 and No. 20 Brads from ¼ to ¾ in. long

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The complete wrench

Forged in one piece of solid steel

Just Three Pieces

HEAD, bar, shoulder and handle frame are forged in one piece and case-hardened.

The only other parts, except the wood facings of the handle, are the extra-heavy knurled thumb-screw, and the extra-strong sliding-jaw.

This is the strongest general-purpose wrench manufactured, and is guaranteed by the trade-mark shown above, "The MARK of the MAKER."

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Sharpen It on a Cleveland

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Look for the Trademark. It's Your Protection.

The little Giant, shown here, is a convenient size for the man who keeps his own tools in order whether in city or on farm. Mounted for power or hand use on ball bearing light running frame. Has tool rest and drip pan. Mounted accurately and runs true.

The Empire has a higher frame, a design made especially for farm use. Extra strong frame insures steady running. If you don't know a Cleveland dealer, or if you need a special purpose stone, write us.

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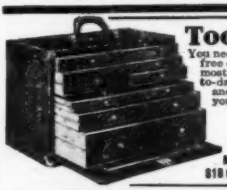

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"How are you going to get your stuff home, Bill?" asked a friend. "Got a steamboat to tow you back?"

"I am going to float it back," was the response.

"How are you going to do that? I don't understand."

"I guess you don't know much about this river. It doubles on itself just below here and runs back to

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Full directions with each stick. It requires no skill. Anybody can use it. Price, Ten Cents.

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bob up at house-cleaning time which really require a Bench and tools. With a Grand Rapids

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"Bed Rock" Planes

For fine work on hard and knotty wood, this Plane surpasses all others.

The Cutter, Frog and Bottom are so machined and fitted that they are practically one solid piece of metal, thus preventing any chance of vibration.

The Frog travels in a groove, ensuring it being square with the mouth of the Plane, and preventing shifting or "wobbling."

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The Cutters are made of the best English steel and are adjustable, both endwise and sidewise.

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These Planes are used by those who pride themselves upon having the best tools obtainable.

A postal will bring you an attractive circular containing complete description

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EVERY MACHINE IS EQUIPPED WITH A CARBORUNDUM WHEEL

the fastest, coolest cutting wheel for all-around work.—The machines are mechanically right—every part accurately made and fitted—carefully assembled—they run quietly—easily—nicely finished—small parts nickeled—made in four sizes—fitted with tool rest.

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At your hardware dealer—who also sells Carborundum Sharpening Stones.

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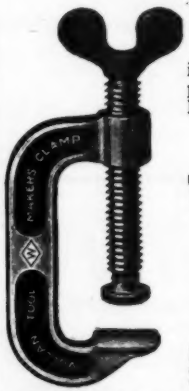
Niagara Falls, N. Y.

Detachable Swivel

"Off agin, on agin!"



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Made in three sizes, with total capacity of 1 to 3 inches; use with or without swivel.

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It takes a wax thread, feeds from spool and does the work of any harness maker machine. It is indispensable for farmers. Agents wanted. Sent prepaid for $1.25. Send at once for catalog.

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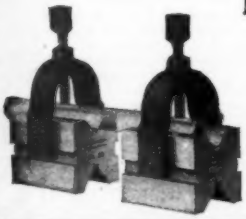

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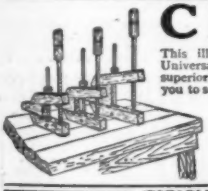

CLAMPS

This illustration shows The Ducharme Patent Universal Clamp, and a glance at it will show its superiority over the old-style clamps, as it allows you to set your work upright and clamp upright, and at the same time to stack them side by side on the bench or shelf while the glue has a chance to set. Write for Circular C and Price List.

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THE DUCHARME MACHINE CO.
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Highest Award World's Columbian Exposition
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Send name of dealer and four cents in stamps for new art catalog.

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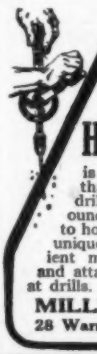

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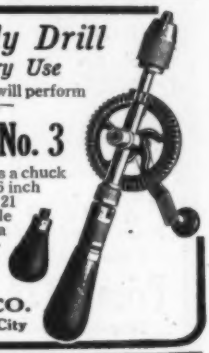
A quality tool that will perform good service always—

HAND DRILL No. 3

is 11 inches long and has a chuck that holds from 0 to 3-16 inch drills. Entire weight 21 ounces. Has hollow handle to hold drill points with a unique, quick and convenient method of removing and attaching handle to get at drills. **PRICE $1.00**



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The "AMERICAN" is the only machine on the market (barring none) that sharpens, hones, and strops razors, sharpens all kinds safety razor blades, scissors, clippers, pocket knives, surgical instruments, etc. No previous experience required. REMEMBER THE "AMERICAN" Key-Cutter is a little wonder. Cuts Square, Angular or Round slots.

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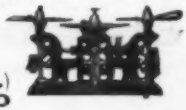

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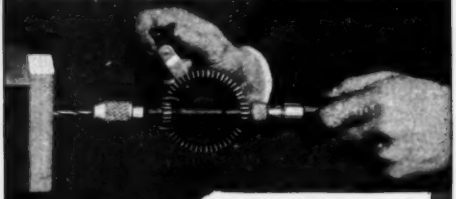
Make Better Mechanics



"Yankee"
No. 1430

THE little hustler, the baby hand drill of the big "YANKEE" Tool family. Small, compact, light — yet strong and durable, and made with exactly the same care, precision and expert finishing as the largest of its brothers. Gives big speed on light drilling — just the tool for small, accurate jobs.

"Yankee"
Plain Hand Drill
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Length - - 10⅛ inches
Weight - - 1¼ pounds

Malleable iron frame, steel spindle with cut teeth. Three-jaw chuck. Holds round shank drills to $\frac{3}{16}$ in. diameter. Detachable handle contains magazine for drills. Adjustable hardened steel bearing in lower end of frame.

"Yankee"
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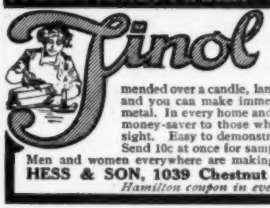

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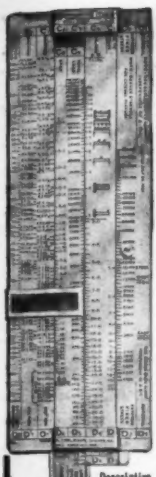

To the Man Without A College Education

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Makes minutes do the work of hours and will pay for itself in one day's use. Solves any beam problem in six seconds or less. Invaluable to Draftsmen, Estimators, Builders, Engineers, Architects, Superintendents. **New** — Nothing else like it at *any price*, the shortest, surest, simplest method of instantly solving all questions concerning strength of beams of **any material, any size, span, spacing or load.** Direct reading and easy to operate. Used and indorsed by eminent engineers and architects. Made of German Silver. Size 21-2 in. x 10 1-2 in.—in cloth covered case, with valuable book of instructions.

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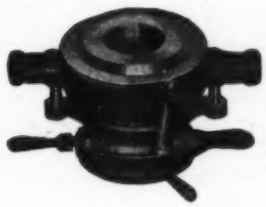
Easy cutting?



Yes— Easy cutting is perhaps the most important characteristic of the die-stock shown here but it's only one of many distinctive features to interest you in the

OSTER MATCHLESS 3B DIE STOCK

For instance, the dies are receding and neither the dies nor guides require changing. Wide adjustment enables you to thread all sizes of pipe from 1 to 2 inch with one set of dies. No bothersome bushings to adjust nor other loose parts to trouble you. This is absolutely the only stock fitted with a *Patented Chip Shield* which prevents chips from clogging the leader-screw and wearing away the thread.

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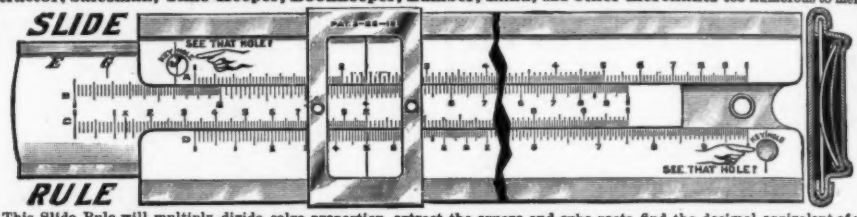
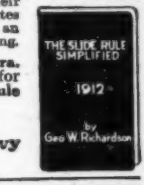
There seems to be a misunderstanding about what the Slide Rule will accomplish, many think it an instrument, the use of which is appliable **only** to Engineers and Technical men. So frequently have I heard this remark that I have completely re-written and enlarged my instruction book, **The Slide Rule Simplified**, which shows the actual setting of the rule by **90 full size engravings**, 52 pages 7x10, each illustration and example is explained and "written so you can understand it." In fact any person who has never seen a Slide Rule, and not a technical person, could not help but learn its use. The examples selected and shown by illustrations are those which frequently come up for solution by the **Banker, Broker, Auditor, Inventory Man, Cost Estimator, Printer, Paper Mfr., Contractor, Salesman, Time-Keeper, Bookkeeper, Lumber, Land,** and **other merchants** too numerous to mention.



This Slide Rule will multiply, divide, solve proportion, extract the square and cube roots, find the decimal equivalent of vulgar fractions or "vice versa," calculate interest, percentage. Also the mensuration of superficies, and the rule of three. For Engineers, Electricians, Draftsmen, Superintendents, Master Mechanics, etc., the rule is indispensable in their work. It is one of the most valuable instruments ever offered to mankind. For Electricians it is a complete wire table in itself. The Richardson Direct Reading Slide Rule is specially designed for those who wish to learn its use. Its operation being very simple. You simply place the key to the problem wanted in the keyhole (the key is printed in red on slide, see cut) and answer is given direct: such as the Horse Power of Engines, Pumps, Boilers, Belts, Water Falls; size of duct for ventilating; radiation and size grate, and steam main; change gear and pulley problems; areas, circumference and diameter of circles. This Rule is my 1913 type now on the market for the first time. Made in **two sizes, coat** and **vest pocket 11x1¼x¼** and **5¾x1¾x¼. 11"** has Sine, Log, and Tangent scales. **No wood** in their construction, scales white celluloid, printed from **engine divided** plates in two colors, and **washable**, secured by an improved locking device in an absolutely non-corrodible **Aluminum** and **Monel Metal** framing.

Price of 11" Rule, ordinary case, **$2.50. Full leather case, 50c extra.** 5" rule and **full leather case, $2.50.** 11" rule, bristol board scales for demonstrating uses, **$1.00.** If ordered now the book, **The Slide Rule Simplified,** goes **FREE** with each rule.



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Chamois lined case.....15c extra

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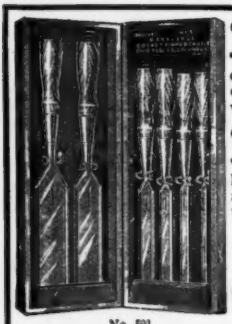

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are made from **high grade and specially selected tool steel,** and the care, skill and experience of our 89 years in the Edge Tool business is put into every tool bearing our "Ohio" Trade Mark shown here. The result is a **high grade and very satisfying tool, with a keen, tough and lasting cutting edge.**

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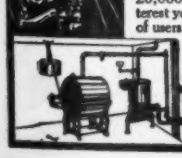

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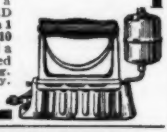

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tion and weighs about 450 lb. The leatherback turtles, which are frequently seen in summer and sometimes captured, do not appear to endure captivity. They swim continually, take no food and soon die.—Fishing Gazette.

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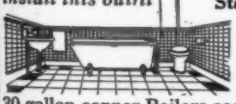

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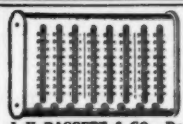

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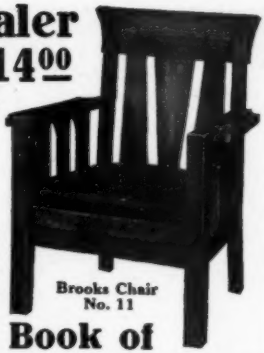

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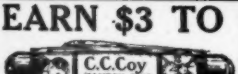

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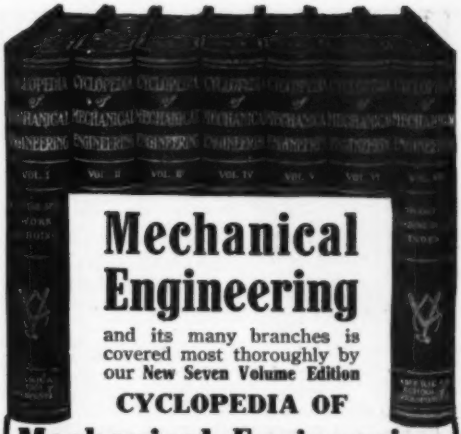

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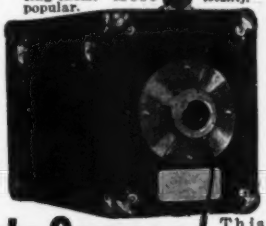

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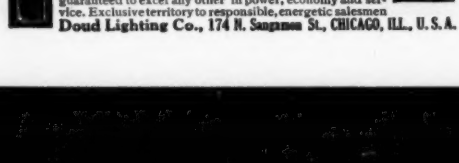

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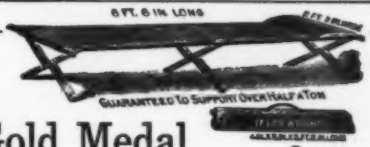

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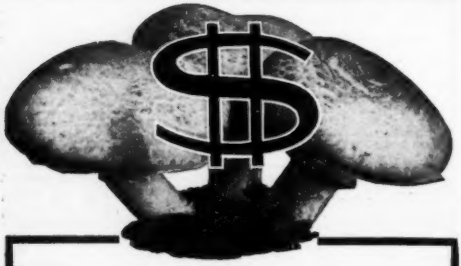

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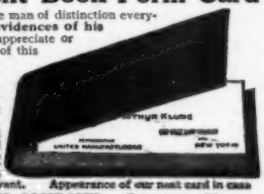

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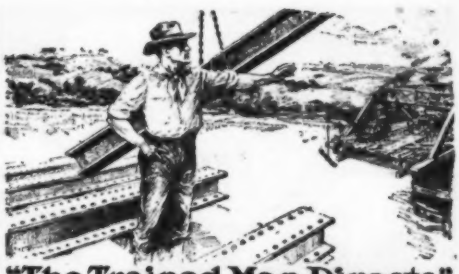

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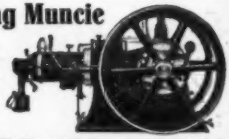

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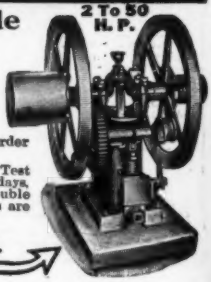

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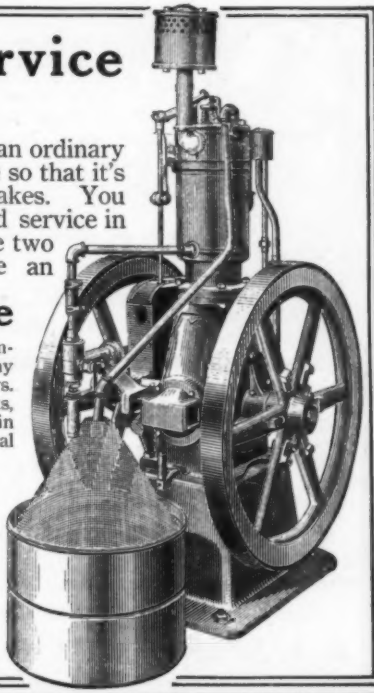

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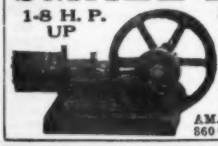

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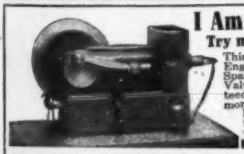

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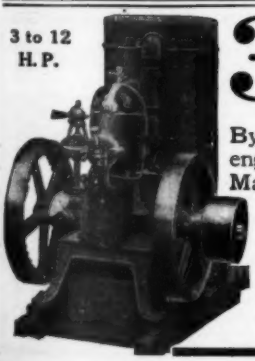

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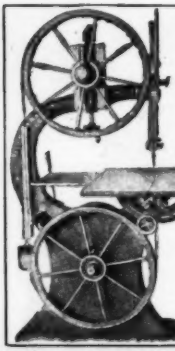

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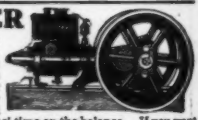

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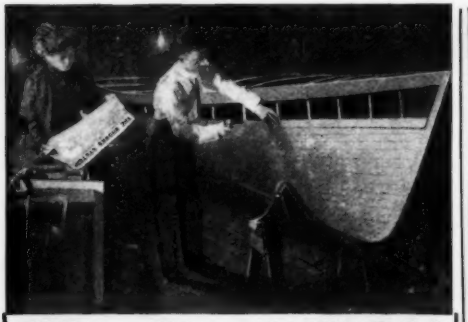

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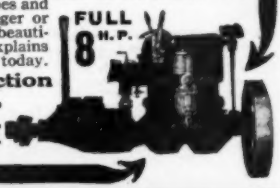

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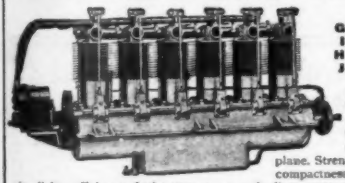

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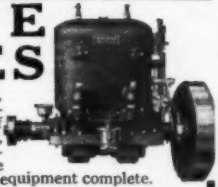

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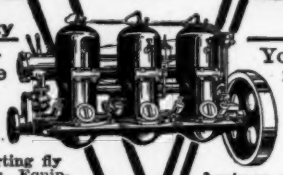

5 to 55 h. p. 3 KINDS—Speed-Regular-Heavy Duty

Strong, neat, simple—absolutely dependable. Give honest, enduring service—constant satisfaction. Win your enthusiastic confidence. Easily accessible—crank case conveniently opened from either side. Non-back-firing. Double ignition. Easy starting fly wheel. Connections for rear-starter. Equipment includes Paragon reverse gears, Mea Magnetos, Noxon distributor, heavy brass fittings and many other exclusive features.

VIM MOTOR COMPANY

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1, 2, 3 and 4 CYLINDER USE GASOLINE OR KEROSENE

Your boat, equipped with a **VIM,** will make your day or evening on the water,—with the pure air, refreshing breeze—the lure of the great outdoors—one of exhilarating enjoyment and healthful recreation. Thousands in use, many of them eight or nine years old. The old boatman picks the **VIM.** Read twenty-seven reasons why in our new book, "Boating Facts".

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Bumble Bee

Roberts Motors are used exclusively in the Bumble Bees. The one shown above is making 24 m. p. h. with a 3 cyl. 15 H. P. Aerolite. The one below is running 14 m. p. h. A 6 H. P. is used in this.

21 Models, 3 to 125 H. P., 1 to 6 Cyl.

All models operate successfully on

KEROSENE OR GASOLINE

Aviation Motors

for Aeroplanes and Flying Boats

4 cyl. 50 H. P. 6 cyl. 75 H. P. 6 cyl. 125 H. P.

MARINE OR AERO CATALOG FREE

THE ROBERTS MOTOR CO.

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Turn Your Row Boat Into A Launch With This 2 H.P AMERICAN Engine

Especially designed for row boats, canoes and launches up to 20 feet long. Just the thing for a fishing boat. If desired can be run slow enough to troll. No reverse gear needed. Engine can be reversed without stopping. Starts without cranking. Guaranteed for life. Sold on 30 days' trial.

$125 Buys This "American Special" 16 Foot Launch

Seats 7 to 9 people. Elegantly finished. Embodies engine described above. Just the thing for summer homes. Send for engine catalog describing complete line. Also boat circular. Write today.

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There was brought into New York the other day what is regarded as the largest turtle ever received from the tropics. It was 10 ft. long and weighed over 500 pounds.

BUILD YOUR OWN STEEL BOAT

From patterns and printed instructions. **Save ⅔ Cost.** Work easy. Material furnished. Also finished boats. Send for catalogue and prices.

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Control Your Motor Boat

this way—it's the safe way

Moving a single lever stops, reverses, or sends your boat ahead. Engine doesn't stop. That is the "Baldridge way." Contrast it with the old, dangerous way of stopping the engine and letting "her" float up. Stop gambling with collisions and "smash-ups."

Get a Baldridge Reverse Gear

—the gear with the unbroken main shaft that positively prevents the usual exasperating gear troubles. Fully enclosed; thousands in use.

Send for free book telling the good points of "Baldridge" construction.

If you are in the boat business, write for dealer's proposition. Some good territory still open.

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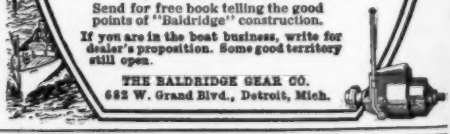

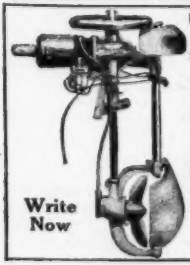

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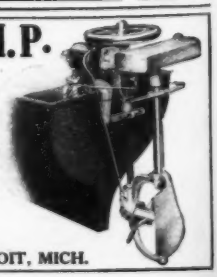
The Powerful "Porto"—55 lbs.—2 H.P.

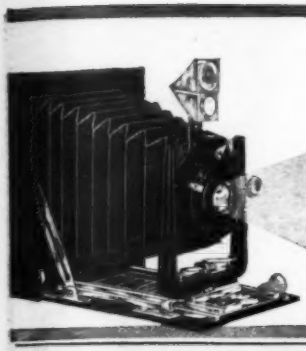
The most power for the **price**—the most power for the **weight**—that's what you get in the ORIGINAL portable marine engine. Note this—2¾ bore, 3 in. stroke—**that's** what counts. That's why the PORTO drives an 18 ft. row-boat **7 miles an hour,** for **4 hours on a gallon** of gasoline.

On or Off in 5 Minutes—Sold on Trial

The new model is copper jacketed, has under water exhaust, steers with tiller ropes. Get our catalog for complete details of this and other Waterman Motors for every purpose.



WATERMAN MARINE MOTOR CO., 120 Mt. Elliott Ave., DETROIT, MICH.



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The famous Yale and Harvard models—highest grade material—finest finished—the strongest, staunchest—handsomest canoes built.

MULLINS CEDAR CANOES CAN'T SINK

When equipped with Mullins Patented Buoyancy Pads these canoes have sufficient buoyancy to float when capsized or filled with water and keep two people afloat. Open gunwale construction—Keel—Heavy Pressed Bronze Bang Plates protecting stems. *Handsome Colored Catalogue Free.*

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from our patterns or knock down frames. You save ¾ the cost and enjoy the work.

Patterns and frames for boats of all types and sizes, from the canoe pattern at $1.75 to the 65 ft. yacht frame at $350

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which tells you all about it. You can build a 20 ft. launch for $30 from patterns, that you could not buy at any factory for less than $150, or you can buy the complete frame and build this 50 ft. cruiser shown in the picture for less money than you would have to pay for the cheapest 25 ft. finished cruiser you could buy.

The Boat You Build

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"Perfect Simplicity" and "Simple Perfection" are the results, embodied in these Motors, of 15 years devoted to the developing of these essential characteristics, which enable us to put on the market a reliable and economical motor at a reasonable price. Write for catalog, stating size and type (2 or 4 cycle) of motor wanted. We also furnish castings for these motors.

BAY STATE MOTOR WORKS
Successor to
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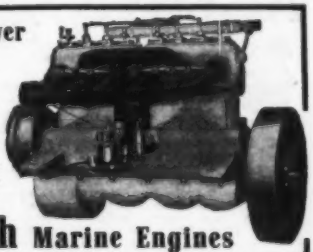
12 Horse Power 4 Cylinder 4 Cycle

Weight 370 lbs.

Speed 600 to 1000 R. P. M.

Made in one size only. A specialized article.



Kermath Marine Engines

the world's standard in 12 H. P. size, are made of the finest materials the market affords and workmanship of pronounced excellence. **Prices $150 to $200**

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WATKINS' SPECIAL MOTORS

3 H. P. Single Cylinder . . 30 lbs.
6 H. P. Double Cylinder . . 60 lbs.
12 H. P. Four Cylinder . . 100 lbs.

A strictly HIGH GRADE Motor that will give CONSTANT and EFFICIENT service. Especially adapted for CANOES and LIGHT BOATS. Aluminum base, copper water jacket, steel shaft, bronze bearings.

THE WATKINS MOTOR CO.
837-839 West Sixth Street CINCINNATI, OHIO

Save a Season's Gasoline Cost Good Times Guaranteed

L-A Motors Direct from Factory to You

Sold on their Merits

Act as your own agent and save the retailer's profit—buy direct from the factory a dependable Lockwood-Ash Motor guaranteed for a year. Six models, all sent on 30 days' trial.

This 1½ H. P. Motor and Complete Outfit, $36.25 Freight Paid

We pay the freight and give you a month to test out the engine. You get a reliable motor with complete outfit, including propeller, ignition system and shaft, as shown. You save at least $13.75—a season's gasoline cost. Give yourself and your friends good times at small expense. Motor boating is a healthful, fascinating and economical sport. Write for our new 1913 catalog today. Post yourself on Motor Boating. Learn about the famous L-A Motors. The catalog's free—write today.

LOCKWOOD ASH MOTOR CO., 208 Horton Ave., JACKSON, MICH.

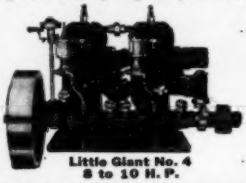
Write to-day for the

STRELINGER

1913 CATALOG

THIS book will make you a better engine buyer. If you are an experienced Motor Boat operator, or inexperienced, you will gain something by reading it. No matter what size or type of engine you are going to buy this year, whether you have decided on the make or not, it is unwise to close the sale until you have at least read the **1913 Strelinger** Catalog. **Strelinger** engines have been running smoothly, powerfully and economically for fifteen years. They are in use in all parts of the world. Over eight thousand satisfied owners can tell you of their merits. Our line is most complete, affording just the right size and type of motor for every boat. This line includes the **Strelinger** four cycle, heavy duty motors ranging from 4 to 40 H. P., and the **Little Giant** line of two cycle, three port, general utility engines powered from 1½ to 16 H. P. in single and multiple cylinders. If you have a runabout, a work boat or a cruiser, you will find the motor you want listed in our 1913 catalog.

Let us send you a copy. Write for it to-day. It's FREE



Little Giant No. 4
8 to 10 H. P.

STRELINGER MARINE ENGINE CO.
171 W. Woodbridge St., *DETROIT MICH.*

This Canoe is a Masterpiece

The test of a canoe is not its *looks*. Will it paddle true? Is it light or does it drag your arms out? Will it last? The

"Old Town Canoe"

answers every canoe query 100% perfect. Beautifully proportioned, beautifully balanced. Light as a feather. True as an arrow. Known the world over for fine construction and reliability. It is built by experts. All planks are long lengths, fastened at each rib with 4 copper tacks, clinched. Agents everywhere show "Old Town Canoes." 3000 in stock here insure prompt deliveries. Write for illustrated, descriptive catalog. Sent free.

OLD TOWN CANOE CO.,
1264 Middle St., Old Town, Maine, U. S. A.

AGENTS $45 TO $80 A WEEK

Thousands of dollars paid to agents already in the field; Will Gunckle, of Ohio, got $240 worth of orders first week. A. Bernider, of Kansas, made $30 in four hours. Made 8 calls, took 6 orders. Well, of Mo., made $10 in one hour. Hamilton, of Wyoming, made $60 first two days. We want good agents in every county in the United States, Canada and Mexico.

NEW INVENTION Just out. Nothing like it. FOLDING BATH TUB. Gives to every home a complete bath room in any part of the house—without expense. Biggest, quickest, surest money maker of the century for agents. Territory being rapidly assigned. Send your application today.

100% PROFIT We back you with our capital and experience. We give you complete instructions, assistance and co-operation. No charge for territory. Don't delay. Send your name at once. Write plainly and give name of your county. Complete particulars FREE. Write today.

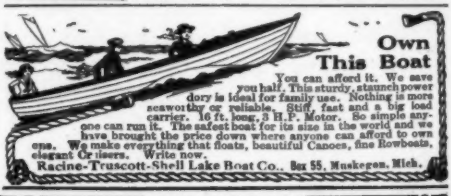
ROBINSON MFG. CO., 130 Vance St., TOLEDO, O.

Build Your Hydroplane

14x4 Toppan Bullet Hull complete $125, K. D. Frame $30. Also **21 ft. V-Bottom Runabout** Hull $225, K. D. Frame $40.

Send for circular. Special prices on Engines.

TOPPAN CO., 3 Haverhill St., BOSTON, MASS.

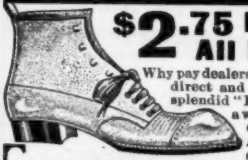


Own This Boat

You can afford it. We save you half. This sturdy, staunch power dory is ideal for family use. Nothing is more seaworthy or reliable. Stiff, fast and a big load carrier. 16 ft. long, 3 H.P. Motor. So simple anyone can run it. The safest boat for its size in the world and we have brought the price down where anyone can afford to own one. We make everything that floats, beautiful Canoes, fine Rowboats, elegant Cruisers. Write now.

Racine-Truscott-Shell Lake Boat Co., Box 55, Muskegon, Mich.

Save $1.25



$2.75 For This $4.00 All Leather Shoe

Why pay dealers and jobbers extra profits—buy direct and save your shoe money. This splendid "LOTZ SPECIAL" (black) shoe is a wonder for either dress or work; Gun Metal side. Guaranteed All Pure Leather, half double sole, reinforced shank, Rocker last. Handsome, durable, stylish; easily worth $4.00—our DIRECT bargain price only $2.75—any size—delivered prepaid. Money back if not the best shoe value you ever saw. Saves you $1.25.

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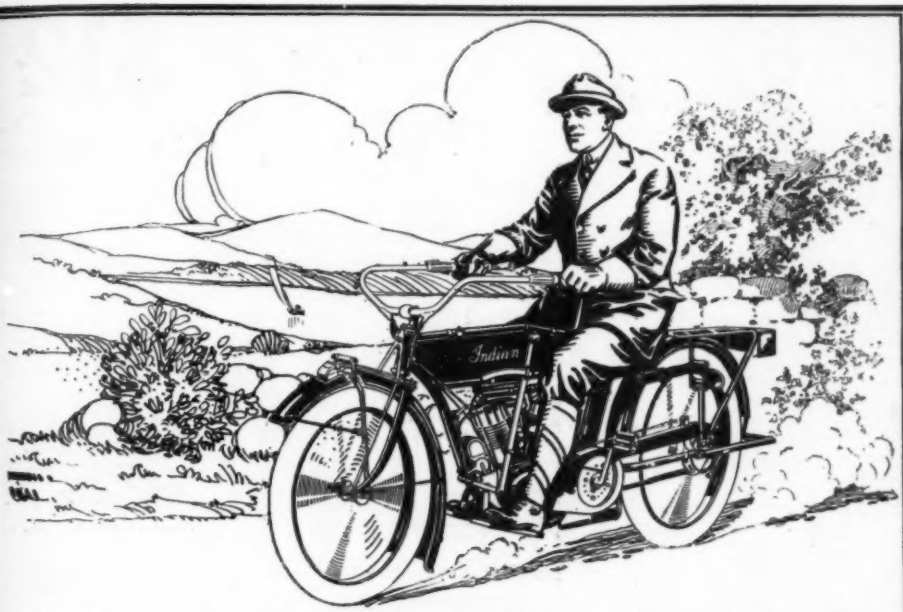


You know motorcyling at its very best when you're astride

The Indian Motocycle

The 1913 models of the Indian Motocycle are as complete and as satisfying as the most exacting rider could demand. The prime essentials of Power, Speed, Flexibility, Comfort, Reliability and Ease of Control are positively superb in each instance. No less than eleven improvements this year. Twenty-nine minor "refinements" in addition. Most important new features are those providing absolute riding comfort. No jolting—no vibration.

The Cradle Spring Frame

is the greatest of all improvements. Riding on the Indian is like riding on air, so smooth is its running. There's no strain on the nervous system and no unnecessary jarring of the machine and fittings. The "life" of the motorcycle is greatly increased.

Equipment of footboards in addition to pedals, on 4 H. P. and 7 H. P. "regular" models, is another new feature. You have the choice of two comfortable riding positions with the double brake control in each. You may use the pedals merely for starting the motor if you wish. Improved luggage carrier will commend itself to tourists and traveling men especially.

Any speed from 4 to 50 miles an hour. Free Engine Clutch gives the Indian a thousand speeds. Motor has reserve power that takes you up any hill. Wonderfully economical motorcycle to maintain. No "extras" on the 1913 models. No increase in prices.

First get a free demonstration from the nearest of our 2000 dealers throughout the country. No matter where you live, there's an Indian dealer handy. Ask us for his name and address.

Prices { **4 H.P. Single Cylinder, $200** / **7 H.P. Twin Cylinder, $250** } **f.o.b. Factory**

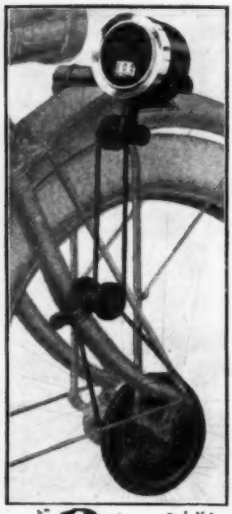
Write us for free 1913 catalog describing all models and improvements

THE HENDEE MANUFACTURING COMPANY, 911 State St., Springfield, Mass.

(Largest Motorcycle Manufacturers in the World)

Branch and Service Stations:

Chicago Denver San Francisco Atlanta Toronto London



$12

Complete with new Two-Belt Front Wheel Drive

This Shows the new Two-Belt Front Wheel Drive

Stewart Speedometer
MAGNETIC PRINCIPLE

The First Practical Motorcycle Speedometer

A speedometer is just as necessary and important on your motorcycle as it is on an automobile. Every automobile is equipped with a speedometer. Eighty per cent of them are equipped with Stewarts.

This new speedometer will pay for itself in a year, in tire adjustments, alone, as practically every tire company bases all adjustments on odometer readings. If you have no odometer it is impossible to correctly figure out your tire mileage.

This new speedometer enables you to keep accurate track of your gasoline and oil consumption. It tells you instantly if your engine is not giving full power and helps you follow road maps when touring.

This is the first really practical motorcycle speedometer ever made. No amount of road jars, rut jolts or sudden jerks can affect the driving arrangement of this speedometer.

It will never get out of line. Our new patented and exclusive Two-Belt Front Wheel Drive makes this impossible.

No amount of vibration can throw the mechanism of this speedometer out of adjustment. It always works with absolute precision under the most severe conditions.

No weather condition can affect it. Works as perfectly in wet weather as in dry weather.

This speedometer can be attached either to your front extension spring or mudguard, so that your headlight will show directly on its face. You can read it at night as easily as in daylight. This is another exclusive feature.

It has a 75-mile speedometer; 100,000-mile season odometer; 100-mile trip register, which can be readily reset to any tenth of a mile without disturbing total mileage of season register.

Examine one of these advanced instruments at once. For sale by dealers all over the world. The price is $12, complete. We guarantee satisfaction.

Write us for a handsome catalogue which fully describes this new and improved instrument

The Stewart Speedometer Factory

1906 Diversey Blvd., Chicago, U. S. A.

POPE MOTOR CYCLES

Three great new features insure your comfort—

Rear Spring Suspension on helical springs that expand, gives you comfort and spring assistance in place of spring resistance. In connection with

The Spring Fork, the frame, motor and rider are ideally suspended. The combination gives a forward gliding motion that will delight you.

Overhead Valves give the most power, the smoothest running, the greatest speed, least surface exposed to heat, best cooling—most complete exhaust of spent gases,—least weight, lowest gasoline and oil consumption and minimum cost to run and maintain. The entire explosion is directly over the piston. All ergy developed is applied with no loss in time nor force, straight downward, with maximum power.

Pope Quality Has Never Been Questioned

Pope Motor Cycles are made in four models

These machines are alike in quality and perfection of detail. Each is suited for a different purpose. **Model H—Lightweight—** 4 h.p., belt drive, imported magneto. Weight 160 pounds. A wonderful value. **$165. Model K—The Big Four—** Big 4 h.p., belt drive, imported magneto, overhead valves, spring seat post, **$200. Model M—5 h.p.—** Chain drive. Bosch Magneto. Rear spring suspension, overhead valves, **$215. Model L—Twin—** Twin Cylinder, 7-8 h.p., chain drive. Bosch magneto, rear spring suspension, overhead valves, **$250.**

Send for the handsome 1913 Catalogue

The finest ever issued. It contains pages of specifications and details, every one of which will interest you. Write today.

The Pope Manufacturing Co.

479 Capitol Ave., Hartford, Conn., U. S. A.

Also makers of Pope Bicycles
—Catalogues Free.

$ MAKE 250.00 A MONTH REPAIRING AUTO-MOBILE TIRES

Be first to enter this new big paying business in your town. Open your pockets. Let the dollars pour in. Act quick. Every auto sold means more tires to mend. Automobile business is growing fast—enormous field for tire repairing. Punctures and blowouts are common. Tires need retreading and vulcanizing. Something going wrong all the time. Thousands forced to buy new tires because they can't get old ones fixed. Think of the old bicycle days—repair shops on every corner—all making money—busy day and night. Autos make same proposition over again—only ten times bigger and better. Users of Haywood Tire Repair Plants are making big money. Johnson, Tex., writes: **"I made as high as $18 profit in a day."** Another man who bought a plant September, 1911, writes he has **cleared over $3000.00.** That's going some! Operate a plant as side line in connection with auto business—garage or as an independent business. Find neighborhood where there's a bunch of autos—get all the steady business besides transient work. Experience unnecessary. You learn quick. Simply follow directions—practice a few days on a couple of old tires and you'll be ready to coin money. Business comes fast and easy.

Repair Tires at Home. Young men! and boys repair father's tires—get money he pays garage man. Get the neighbor's work. Make money to attend college or to start a garage and repair business. **Auto owners**—repair your own tires—save money—pay for your outfit in short time. We have outfits for home use. Anyhow investigate. Send today for catalogue. See the wonderful possibilities in this marvelous field. Learn of the enormous money-making opportunities in this fascinating new business.

HAYWOOD TIRE & EQUIPMENT CO., 609 N. Capitol Ave., Indianapolis, Ind.

$92.50—Our Price for Next 30 Days

We now offer the Edwards "Steelcote" Garage (1913 Model), direct-from-factory, for $92.50. But to protect ourselves from advancing prices of steel, we set a time limit upon the offer. We guarantee this record price for 30 days only. Just now we can save you $35 or more.

Edwards Fireproof Steel Garage

Quickly Set Up Any Place

An artistic, fireproof steel structure for private use. Gives absolute protection from sneak thieves, joy riders, fire, lightning, accidents, carelessness, etc. Saves $20 to $30 monthly in garage rent. Saves *time, work, worry and trouble.* Comes ready to set up. All parts cut and fitted. Simple, complete directions furnished. Absolutely rust-proof. Joints and seams permanently tight. Practically indestructible. Locks securely. Ample room for largest car and all equipment. Made by one of the largest makers of *portable* fireproof buildings. Prompt, safe delivery and satisfaction guaranteed.

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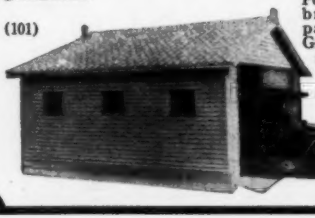

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Agents' Price One AMERICAN Motorcycle or Bicycle

$139.85 Honest hand-made machines at factory cost. Write now for catalog. Say whether interested in Motorcycle or Bicycle. $18.85

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Ten Days' Free Trial

allowed on every bicycle we sell. We **Ship on Approval and trial** to anyone in the U. S. and *prepay the freight.* If you are not satisfied with the bicycle after using it ten days, ship it back and *don't pay a cent.*

FACTORY PRICES *Do not buy* a **bicycle** or a pair of **tires** from *anyone at any price* until you receive our latest **Art Catalogs** of high grade bicycles and sundries and learn our *unheard of prices* and *marvelous new special offers.*

IT ONLY COSTS a cent to write a postal and everything will be sent you **FREE** by return mail. You will get much valuable information. **Do Not Wait;** write it **Now!**

TIRES, Coaster-Brake rear wheels, lamps, parts, repairs and sundries of all kinds *at half usual prices.*

MEAD CYCLE CO. Dept. L 108 CHICAGO

NEW AUTO TIRES

28x3....	$ 7.50	32x3½..	$ 13.00	34x4....	$18.75
30x3....	8.00	33x3½..	14.00	36x4....	20.00
32x3....	8.50	34x3½..	14.00	35x4½..	24.00
29x3½..	11.00	30x4 ..	16.00	36x4½..	27.50
30x3½..	12.00	31x4 ..	17.00	37x4½..	31.00
31x3½..	13.00	32x4 ..	17.50	37x5 ..	35.00

The above are Diamond Tires, but as we are selling them at 40 per cent less than regular prices, maker's name is buffed off.

SPECIAL OFFER Send us the money for the amount of order (or if satisfactory will ship C. O. D. when expressage accompanies order), use the tires ten days, and if you are not satisfied we agree to refund amount paid on return of tires to us at Chicago.

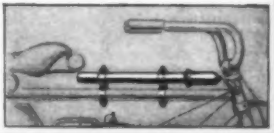
CARLSTEN-WILLIAMS CO., Dept. P.
S. E. Cor. 22nd Street and Michigan Avenue, CHICAGO

BICYCLE LAMP

BURNS GAS—MAKES ITS OWN GAS

If you ride a wheel, get a "SEARCH-LIGHT" gas lamp. It gives a better light than any other lamp. It enables you to see far ahead, see all the ruts and holes and ride just as easily and fast as you would in the daytime. The "SEARCH-LIGHT" makes its own gas. It won't jar out. The "SEARCH-LIGHT" is nickel-plated, has red and green jewels, universal bracket, can be adjusted to any angle and attached to either head or fork. Ask your dealer. If he's sold out, write for handsome illustrated catalog—it's free.

You Need a New Pump At this season of the year, it's time to buy a new pump. We make *more* bicycle pumps than any other manufacturer. BRIDGEPORT Pumps are reliable and always work. Tell your dealer you want a "BRIDGEPORT Pump."



Write today for our handsome, illustrated pump catalog

BRIDGEPORT BRASS CO., P. O. Station K, Bridgeport, Conn.

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We Make the Price

To get our latest book FREE, give name of your motorcycle. This is the most complete exclusive motorcycle accessory catalog ever published. You can't afford to be without it. Address us today.

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No hill too steep. No sand too deep.

OLYMPIC 4 cylinders $1500
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MOTORCYCLE SUPPLY CATALOGUE

LOWEST PRICES—LARGEST EVER ISSUED

In it we list 1242 guaranteed articles for the motorcycle owner at prices lower than others. We pay transportation charges. A $20,000 stock for immediate shipment. Motor repair parts at half price. You can't be up-to-date without our 1913 catalog.

For 4c, catalog will be mailed to you. Write today.

MOTORCYCLE EQUIPMENT CO.
MFGS CATALOG HAMMONDSPORT, N.Y.

Write for Booklet

Agents Wanted

The FEILBACH LIMITED

is a Motorcycle of SPEED and STYLE

It is built at a slightly higher price to meet the demand for a **higher grade** machine. It is the first machine of such riding quality, ease of control and dependability so as to recommend itself for ladies' use. A mechanical examination and a trial of the marvelous horizontal spring seat support would convince you. 5 H. P., long stroke, offset crank, clean, silent, smokeless, bumpless. **PRICE $250**

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The brake that saves!

Corbin Coaster Brake

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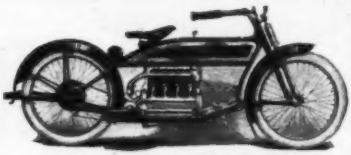
Fitted to your wheel at any bicycle repair shop. Gives you instant control, prevents accidents. The two-speed model is an immense assistance when riding on up-grades and against strong head winds. Invaluable to elderly riders especially. Corbin Brakes are operated solely by the pedal. Simple, strong and reliable.

Send for 1913 free catalog showing all Corbin Brakes, Hubs and Axles

CORBIN SCREW CORPORATION DIVISION
(American Hardware Corporation)
302 High Street New Britain, Conn.
Licensed Coaster Brake Manufacturers

Without an Equal



THE HENDERSON
4 cylinders; 8 H. P. **$325**

¶ The Henderson is literally without an equal.

¶ And it is the only motorcycle that has the flexibility, the continuity of power development and the vibrationless comfort that result from multiple cylinders.

¶ Give these facts due consideration before you buy; and write for the Henderson catalogue.

Henderson Motorcycle Co.
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Treat Your Tires With NEVERLEAK

Tire Fluid

It means freedom from tire troubles for the rest of the season; freedom from worry and unnecessary expense.

With Neverleak in your tires you can always depend upon reaching your destination without aggravating stops for repairs. You can enjoy the convenience and pleasure of wheeling more than ever before.

It makes your tires leak proof and heals punctures on the run without your even knowing they have occurred. It makes your tires wear longer.

A 25c tube treats a tire and it will last as long as your tire lasts. Treat your tires with Neverleak now—today. Don't wait. You can get Neverleak of any bicycle repairman or dealer in bicycle supplies. They all use and sell it.

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$40 Motorcycle

We have the largest line of new and used Motorcycles in the country at the lowest prices. We also have a thoroughly equipped repair department and are in position to furnish repairs for any machine. Send us your machine to be overhauled. We pay cash for second hand motorcycles. *Send for Catalog.*

HARRY R. GEER CO., 888 McLaran Ave., ST. LOUIS, MO.

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Projects a 14-candle power light 150 feet. Burns Acetylene gas. Weight, 6 oz.; height, 3½ in. No oil, soot or glass. Absolutely safe and simple. Fifty hours' light costs 25c. Ideal for Night Fishing, Trapping, Hunting or for work about the farm or machinery. Useful as well to replace automobile tires in the dark. If your dealer cannot supply you write us direct and ask for catalogue and free instructive booklet, "Knots and How to Tie Them."

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Price, $1.00 **162 Leonard St. New York City**

RANGER BICYCLES

Have *imported roller chains, sprockets* and *pedals; New Departure Coaster-Brakes* and *Hubs; Puncture Proof Tires; highest grade equipment* and many advanced features possessed by no other wheels. *Guaranteed 5 yrs.*

FACTORY PRICES direct to you are less than others ask for cheap wheels. Other reliable models from $12 up. A few good second-hand machines $3 to $8.

10 DAYS' FREE TRIAL We ship on approval, *freight prepaid*, anywhere in U.S., *without a cent in advance.*

DO NOT BUY a bicycle or a pair of tires from *anyone* at *any price* until you get our big new catalog and *special prices* and *a marvelous new offer*. A postal brings everything. *Write it now.* **TIRES, Coaster-Brake Rear Wheels,** lamps, parts, sundries, *half usual prices.*

Rider Agents everywhere are coining money selling our bicycles, tires and sundries. **Write today.**

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Bicycles 50% Off

Factory Price until we close a retail dealer in your community. When retail dealer in your community takes hold of "America" line this offer positively ceases. Order **at once** and save **HALF.**

Famous "America" Wheels

Not "cheap" mail-order wheels. Not sold in a "cheap" mail-order way. Only wheel with Truss Frame, giving double strength, and Hygienia Spring Fork, taking up every shock. Comes complete. **GUARANTEED TEN YEARS (twice** the guaranty of any other wheel). Protection from thieves—protection from accidents. Satisfaction or money back.

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Antomobile, Motorcycle and Bicycle accessories, tires and specialties mailed on request. Discount to *Dealers.*

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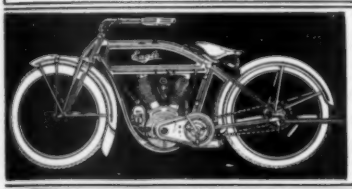

THE GREAT AMERICAN Eagle

9-12 H. P. Chain DRIVE TWIN

Send for catalog and prices.

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Build YOUR OWN SIDE CAR Motorcycle

Side Cars two parts. Four models to choose from. Send for Catalogue and terms.

$65.00 UP

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5 H. P. 1913 Peerless Motorcycle

With Free Engine Idler and Bosch Magneto, together with the best there is in motorcycle construction—Power, Silence, Endurance, and those Wearing Qualities so essential for low cost of maintenance.

5 MILES FOR ONE CENT

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THE FLYING MERKEL

The Only Self-Starting Two-Speed Motorcycle in the World.

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The Roof is More Than Simply Protection Against the Weather

It is the most prominent feature of your home. The feature that is first to be seen and that makes or mars the rest.

Flex-a-Tile Asphalt Shingles

are as durable as slate—as light and as economical as wood and as beautiful as tile.

Made of solid asphalt, surfaced with chipped slate or granite in rich natural colors of green or red—colors that can't come off or fade because they *are* natural.

Don't fail to write for the Flex-a-Tile Book and a free sample

A great proposition for wide-awake dealers—write for details

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1021 Forty-fifth Avenue
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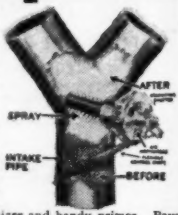
On Your Motorcycle

Attach to handle bar. The marvelous speed spray for motorcycles. Lydon Speedler fits every motorcycle. For speed. For power. For cooling. For economy. Attach in a few minutes. Increases engine power 20 per cent or more. Gives your motorcycle a marvelous increase in speed. Removes carbon. Keeps engine cooler. Positively guaranteed on 30 days' free trial. Your money back if it does not pay for itself in a month.

More Speed

A Lydon Speedler gives your motorcycle more speed when you want it. Control at your finger-tip always. A finger-tip touch and you have a marvelous increase of power, of speed and saving of gas. It's the spray that does it. The powerful cross-current air spray of the Lydon Speedler remixes the mixture to the highest degree of combustion. Speedler will give more life and value and higher speed in your motorcycle than any device ever perfected.



Increases Engine Power Get more power and speed. Add 20 per cent to your present engine power by attaching a Lydon Speedler. Make your engine run smoother. Speedler is a perfect decarbonizer and handy primer. Pays for itself every month. It has our absolute money-back guarantee.

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The Lydon Speedler is sold on 30 days' free trial. Use it for 30 days and get your money back if you are not entirely satisfied. Dealers everywhere are authorized to give 30 days' free trial. If your dealer is not supplied write to us for full descriptions and all particulars. Use it 30 days free and get your money back if you are not delighted with it. Write today for full description of this marvelous money saving, power making, speed device, postpaid free.

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Locate Your Ignition Troubles with One Glance

The *J. D.* Visible Gap Spark Plug lays bare all ignition trouble. If the spark is seen jumping the gap, but ignition is faulty, look for your trouble between the gap and the sparking point. If there is no spark in the gap, your trouble is behind. This new great plug also facilitates timing, intensifies spark, uses only minimum current and cleans itself when you widen the gap by turning knurled adjusting nut. Gap can also be entirely closed.

JEFFERY-DEWITT CO. DETROIT, MICH.

Every part is made in our own factory—even the heat-defying porcelain being produced in our potteries from secret formulas. This unequivocal guarantee goes with every plug.

"YOUR MONEY BACK OR A NEW PLUG IF YOU ARE NOT SATISFIED."

If your dealer hasn't the J. D. Visible yet, send your money direct to us, specifying size wanted or make of car, and we will ship prepaid. Remember, the price is only $1.00 for this plug.

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$1.00

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The Only Practical Light for Motorcycles

Prest-O-Lite is the only lighting system that makes night riding possible, pleasant and SAFE.

The ready-to-use gas costs no more—usually costs less—than the carbide a generator consumes.

The first cost is low ($10). Prest-O-Lite never gets to be second-hand, and is always a READY CASH ASSET.

You can easily afford it. You cannot afford to be without it if you ride at night. One accident might cost you more than years of Prest-O-Lite service.

Easily attached to any motorcycle. We will arrange for immediate exchange service for anyone, anywhere.

See any motorcycle (or automobile) dealer, or write us.

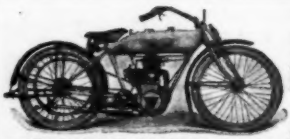
DON'T ACCEPT AN IMITATION!

The genuine Prest-O-Lite, when empty, can be immediately exchanged for a full one, ANYWHERE AND ALWAYS. Imitations cannot.

The Prest-O-Lite Co., Indianapolis, Ind.

Branch offices and Service Stations in all principal cities. Charging plants in all parts of the country.

Exchange Agencies Everywhere



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VALVELESS TWO-STROKE
Motorcycle
SIMPLE—NEAT SERVICEABLE

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MAKE YOUR BIKE A MOTORCYCLE

at a small cost, by using our attachable outfit. Fits any Bicycle. Easily attached. No special tools required.

"It Runs Fine!"

Mr. Blacketer, of Indiana, writes: "I received my attachment in first-class condition. The motor was easily attached, and runs fine. It does not take an experienced person to run a Shaw. I recommend it to anyone desiring, at a small cost, a motorcycle for power, speed and reliability."

FREE BOOK Write today for bargain list and free booklet, fully describing the SHAW Bicycle Motor Attachment. Motorcycles all makes, new and second-hand, $35.00 up.

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FOR the new Standard of tire service demanded in present day motoring, motorcycling and bicycling, you must come to

PENNSYLVANIA Oilproof VACUUM CUP TIRES

The Double-distance Tires that positively Defy Skidding and are Immune from "Oil Disease."

Motorcycle Size, Automobile Tires —that's what Vacuum Cup Motorcycle Tires are—made exactly the same as the phenomenally long wearing Vacuum Cup Automobile Tires—same construction, same stock, same Sea Island cotton fabric with a tensile strength of 420 lbs. per square inch, as against 125 in other motorcycle tires.

Guaranteed for 5,000 MILES and average far more

RED TREAD VACUUM CUP OILPROOF BICYCLE TIRES

Single Tube and Clincher Type

Have precisely the same characteristics and carry our exceptional guarantee of an entire season's satisfactory service under the liberal conditions printed on tag attached to each tire. Everywhere the tire demand is swinging over to Vacuum Cup Oilproofs like a tide—from motorists, motorcyclists and bicyclists alike.

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An Independent Company with an independent selling policy

Forget This

SOLVED! The SHIRT PROBLEM

A few seconds is all it takes to slip on or take off the Signal Coat Shirt. The coat style prevents yoke-splitting, temper-trying, overhead-tugging. And this is only *one* of a combination of comfort features you get in no other shirt no matter how much you pay.

SIGNAL COAT SHIRT $1

Union Made ***Two Detachable Collars***

the only work shirt worth having: Extra Button at Bottom of Breast Plait, Rip-proof, gap-proof sleeve slit; specially cut skirts overlapping 3 inches in front; 2 detached or one attached collar as desired; buttonholes for white cuffs; double-needle machine stitching; 2 pockets, one a triple combination for pencil, watch and handkerchief.

In comfort and in *economy* the Signal has solved the shirt problem for every railroad man who ever wore it. It will end *your* difficulties.

Is This Worth Proving? Ask your dealer. If he hasn't Signals, tell us his name and your size and we will express you a couple C. O. D. If not delighted with them on examination, *return at our expense.*

Write for folder showing big variety of other styles and sample swatches. Address

SIGNAL SHIRT

Hilker-Wiechers Mfg. Co.
Mfrs. of SIGNAL Work Clothes
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Learn This

Weekly Salary Guaranteed

How's That Strike You?

Some liberal offer, Hey? It's just exactly what we do for you. We put you on a regular salary basis besides enabling you to make the *biggest cash profits on regular sales* in the tailoring business. All we ask is that you wear and show our high grade, hand-tailored, made-to-measure suits, overcoats, genuine English slip-ons, etc., and be

The Best Dressed Man in Your Town —And We Pay You a Salary

The Knickerbocker Tailoring Company is the *one* house that *really* boosts the game for *you*—we're the Big Tailoring House that does things on a *big*, generous scale. We give you *more* at the start than others can figure out in 20 years. *We prepay everything*—and if our garments are not satisfactory you don't accept them. Quit fooling around with the old plan—cast your lot with the BIG house that pays you like a prince and treats you like a gentleman.

We're the ONLY House Paying Salaries

Don't forget that; *we want you to know this is true yourself.* Not only do you get a big weekly salary, but we furnish you with a complete Sample Outfit—the swellest ever put out—everything necessary—FREE and *Express Prepaid.* No money needed with us. In addition to all this, just to show you what kind of people we are, we'll give you a

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for good measure. YOU CAN'T BEAT IT. We've simply knocked the props from under 'em all. Now get this:

We'll Put You on Our Pay Roll AT ONCE!

So send us your name and address today—be the first in your town to get this wonderful, liberal salary. Do it NOW.

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"Little Wireless Phones"

For the ears that will cause you to

HEAR

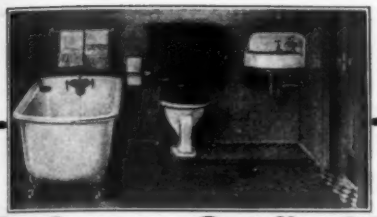
What eye glasses are to failing sight, my invisible ear drums are to lost or failing hearing. Just as simple and common sense and on the same principle, for they magnify sound as glasses magnify sight. They are really tiny telephones of soft, sensitized material, safe and comfortable, which fit into the orifice of the ears and are invisible. They can be removed or inserted in a moment and worn for weeks at a time, for they are skillfully arranged for perfect ventilation and anti-friction. These little wireless 'phones make it easy to hear every sound distinctly, just as correct eye glasses make it easy to read fine print. Among the nearly 400,000 people whom they have enabled to hear perfectly, there has been every condition of deafness or defective hearing. No matter what the cause or how long standing the case, the testimonials sent me show marvelous results.

Common-Sense Ear Drums

have restored to me my own hearing—that's how I happened to discover the secret of their success in my own desperate endeavors to be relieved of my deafness after physicians had repeatedly failed.

It is certainly worth your while to investigate. Before you send any money just drop me a line. I want to send you *free of charge* my book on deafness and plenty of evidence to prove to you that I am entirely worthy of your confidence. Why not write me today?

GEORGE H. WILSON, President
WILSON EAR DRUM CO., Incorporated
1024 Inter-Southern Bldg. LOUISVILLE, KY



Bathroom Outfit $35

These handsome high-grade plumbing fixtures furnished complete, guaranteed and sold direct, saving you all dealers' profits! Bath Tub and Basin are white porcelain enamel over high-grade cast iron. Toilet is vitreous china with oak seat and copper lined Oak Tank. Any handy person can install outfit; no hot metal required.

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Black Steel Tank, 145 gallon capacity, 2½ inch Brass Lined, Double Action, Combination Air and Water Pump, including all Pipe, Fittings, Valves, Gauges, etc., complete.

Heating Plants $95 Up

We will save you 30 to 60 per cent on a modern steam or hot water heating system, complete in every detail.

Free Book Our catalogue illustrates and describes everything in the heating and plumbing line at wholesale prices. SEND FOR IT TODAY.

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Learn the new profession Tree Surgery

Not overcrowded and offers splendid and unusual opportunities to honorable young men. Ages 20 to 28. Students must have attended high school, and be at least 5 foot 7 in height, physically sound and of good character. After completing two years' course, good men make $1,000 to $5,000 a year. Positions guaranteed to good men after graduation. Every city, park, orchard and private estate needs an Expert Tree Surgeon. Positions open also with established companies or State and National Governments. Special attention to Fruit Growing. Tuition moderate, including first year's board. We pay salary second year. Write promptly for full particulars. Address the Secretary.

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Health? Take Turkish Bath at Home—Only 2 Cents

Physicians are abandoning drugs for this new treatment. If your mind or body is tired, open your pores and feel the rapid change in your condition, at cost of 2c a bath. **The Robinson Bath Cabinet** is the only scientifically constructed bath cabinet ever made for the home. **Great $2 Book Sent Free**—"The Philosophy of Health and Beauty". Write today. **Agents Wanted** ROBINSON MFG. CO., 319 Robinson Bldg., Toledo, O

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For a Live, Hustling Man

We offer exclusive protected territory to wide awake men to sell International Ideal Portable Gasolene Lamps and Lighting Systems and to attend to our business.

Your Chance!

Territory is being taken rapidly. If you want to make a business man's income, write to us now. Our plan insures quick sales and our exclusive models and patents distance all competition. Don't hesitate. "Our Help Sales Plan" means dollars to you. Splendid side lines. Our newly patented self-heating sad iron beats any and all.

For full particulars write

International Light, Novelty & Specialty Co.
311 River St., Dept. 20, CHICAGO

Deaf People Now HEAR

Distinctly! Clearly! Perfectly! *In The Hollow of Your Hand*

every kind of sound with the aid of the latest marvelous invention, the remarkable

New 4-Tone Mears Ear Phone

The great, new electrical marvel for the deaf. Perfect hearing at last! This remarkable invention has four different sound strengths, four different adjustments, instantly changed by a touch of the finger. You regulate the instrument by a tiny switch to meet any condition of your ear or to hear any sound—low pitched conversation near you or sounds from any distance. The whole range of hearing of the healthy, natural ear is covered by this new 4-Tone Special Model Mears Ear Phone.

Special Limited Offer

Write at once for our Big Special Introductory Offer on this new wonder. To advertise and quickly introduce this greatest of all inventions for the deaf, we are going to sell the first lot of these new **four-tone** phones **DIRECT** from our laboratory to users at the jobber's lowest net price. This offer applies only to the first lot finished—a limited number. Write today—send the coupon—and you can save more than one-half the retail price. A few dollars, payable on easy terms, if desired, secures you complete relief from your affliction. But the **jobber's price** is confidential. You must write for it. Do it now and save both wholesaler's and retailer's profits.

Try it 10 Days in Your Own Home FREE

Every Mears Ear Phone is sold only on Free Trial. Ask about our great free trial offer. Test this amazing instrument on your own ears, under any conditions of service for ten days. Nothing to pay for the trial. The Mears Ear Phone is the only scientific and perfect hearing device for the deaf. Already 14,000 Single Tone Mears Ear Phones have been sold.

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If you live in New York call at our office for free demonstration.

The Mears Ear Phone book explains all the causes of deafness; tells how to stop the progress of the malady and how to treat it. Send the coupon at once for Free Book and our Special Limited Introductory Offer. Send at once.

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New York, N. Y.

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45 W. 34th Street
New York, N. Y.

Gentlemen: Please mail me, free and postpaid, your Mears Ear Phone Booklet and particulars of your Special Introductory Offer on your new model Four-Tone Mears Ear Phone and Free Trial Offer.

Name .....

Address .....

COMPLETE 5-ROOM HOUSE $298

ALADDIN

READI-CUT HOUSES SAVE MONEY

ALADDIN Readi-Cut Houses are not portable. They are built exactly the same as any well constructed dwelling house. They cannot be taken apart when once erected. They are strong, warm, convenient **and permanent.** Our patent plaster board is warmer than lath and plaster. Aladdin houses are the original knocked-down houses. They have been used for years in every part of the country. Aladdin houses are sold under a positive and definite guarantee backed by a gold bond. This guarantee covers safe arrival of material, quality and quantity. The Aladdin catalog contains 100 designs to choose from.

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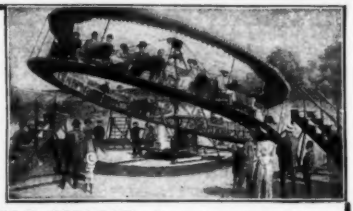

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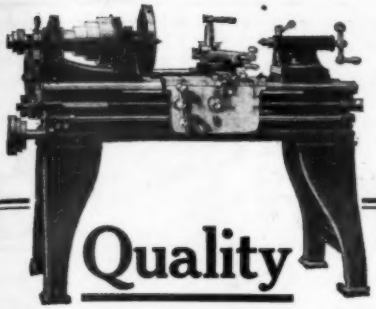

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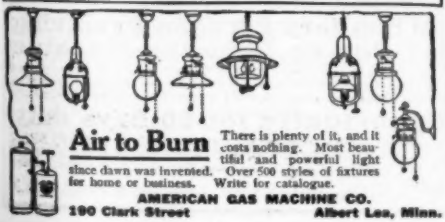

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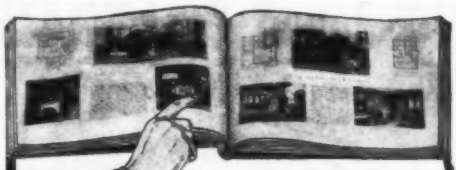

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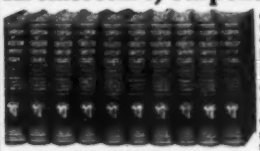

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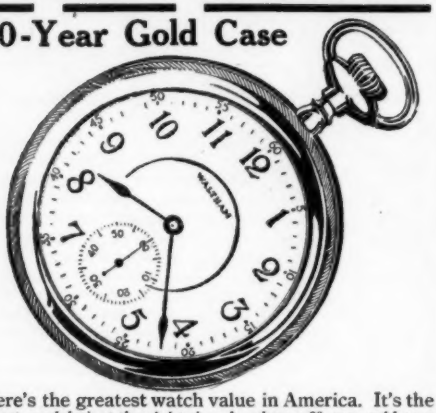

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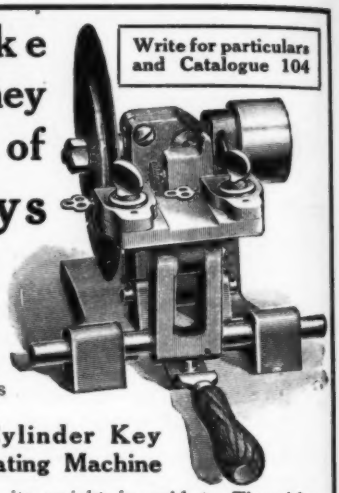

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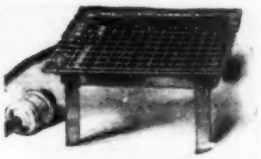

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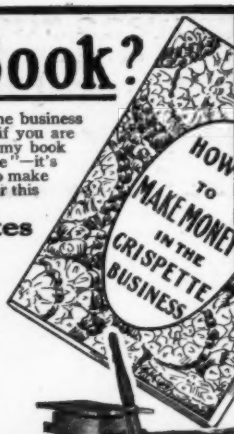

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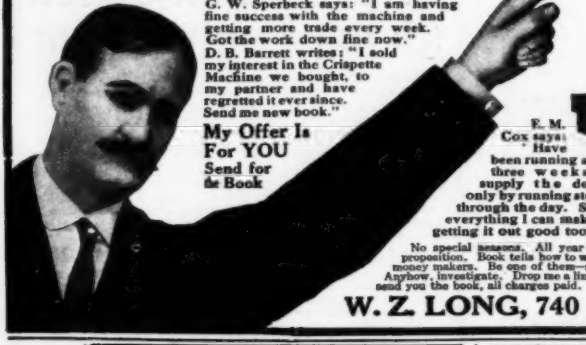

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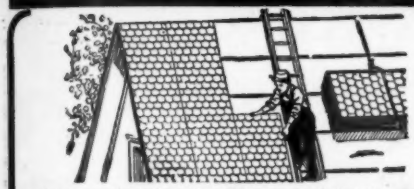

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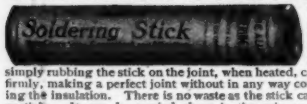

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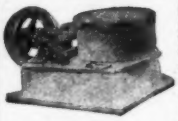

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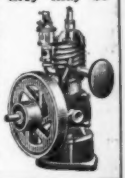

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There are too many Good People Trying to Live in the Cities on a slender margin of Resources, who Ought to Be Elsewhere in this Broad Land where Fertile Acres stretch Unoccupied under Gentle Breezes, and where All of the Best of Earth's Products are to Be Found in Overflowing Abundance. A Pied Piper is Perpetually Pulling Them from the Country to some Magical Metropolis, and There They Live and Swelter in City Tenements and Flats—Dreaming of the Days when "Three Square Meals" was a Habit and not a Hallucination. The City's Lure has Led Them from the Country Fields that Fed Them. I didn't Intend to Break into Poetry, but *I Do Want You to Break Away from Poverty.*

My Advice to You, therefore, is—GET A HOME IN GULF COAST TEXAS. I would Further say—GET A HOME IN OUR DANBURY COLONY—IN THE RAIN BELT, where you can Grow Three Big Money-Making Crops a Year, and Where IRRIGATION and FERTILIZATION do not eat up the Profits Your HANDS CREATE.

We are Extending to our Colonists the kind of CO-OPERATION that CO-OPERATES—building Bridges, making Roads, and Ditches, etc., and have Expended nearly Fifty Thousand Dollars the past Summer in such Improvements. More than Ten Thousand Acres have been Sold during the past ten Months to Satisfied Purchasers, because we have a proposition that can Stand Unashamed beneath the Spot Light of Publicity, and Where Your Days of Prosperity Shall Be Long Upon The LAND. We are selling Real Land and not Sand—GET THAT—a Rich, Loamy, Black Soil, that YOU COULDN'T WEAR OUT IN A HUNDRED YEARS.

I believe you could save Twenty-five Cents a Day if You tried. I know you would Try if you Realized that our Growers of Figs, Strawberries and Early Vegetables clear a net profit of $300 to $500 an Acre. Men have Realized more than $1,000 an Acre growing Oranges in our Country. Remember that our Early Vegetables get to Northern Markets in Mid-Winter and Early Spring, when they command Top Prices.

One German Truck Grower on adjoining lands this spring realized nearly $500 from three-fourths of an acre of Strawberries. You could do as well if you only Tried, and on a Ten-Acre Tract FIND FINANCIAL FREEDOM.

The Biggest Price paid for a car of watermelons on the Houston Market this year was $140. The car was shipped by the Danbury Fruit and Truck Growers' Association.

We are situated within convenient shipping distance of Three Good Railroads, and in addition to this have the inestimable Advantages of Water Transportation through the Splendid Harbors of Galveston and Velasco, so that our Freight Rates are Cut Practically in Half. The Climate is Extremely Healthful and Superior to that of California or Florida—Winter or Summer—owing to the Constant Gulf Breeze.

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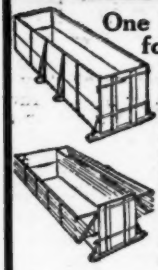
Write for our Free Book, which contains nearly 100 Photographs of Growing Crops, etc. Fill Out the Blank Space below with your Name and Address, plainly written, and mail it to the Texas-Gulf Realty Company, 1510 Peoples Gas Building, Chicago, Illinois. Read it Carefully, then use your own Good Judgment.

* * *

Please send me your book, "Independence With Ten Acres."

15 Wagon Beds and Racks in One



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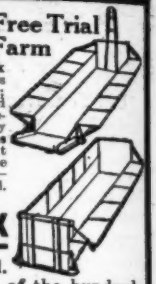

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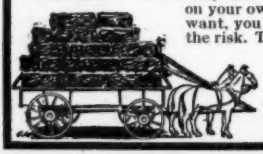

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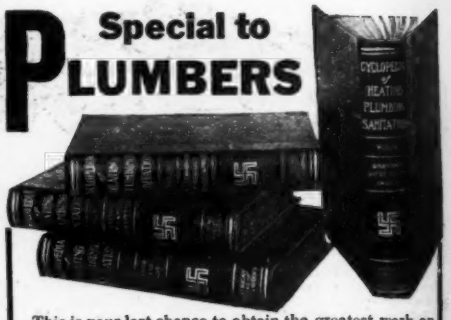

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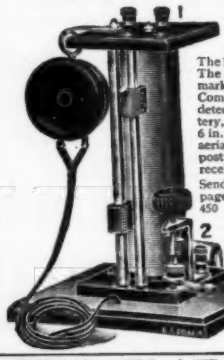

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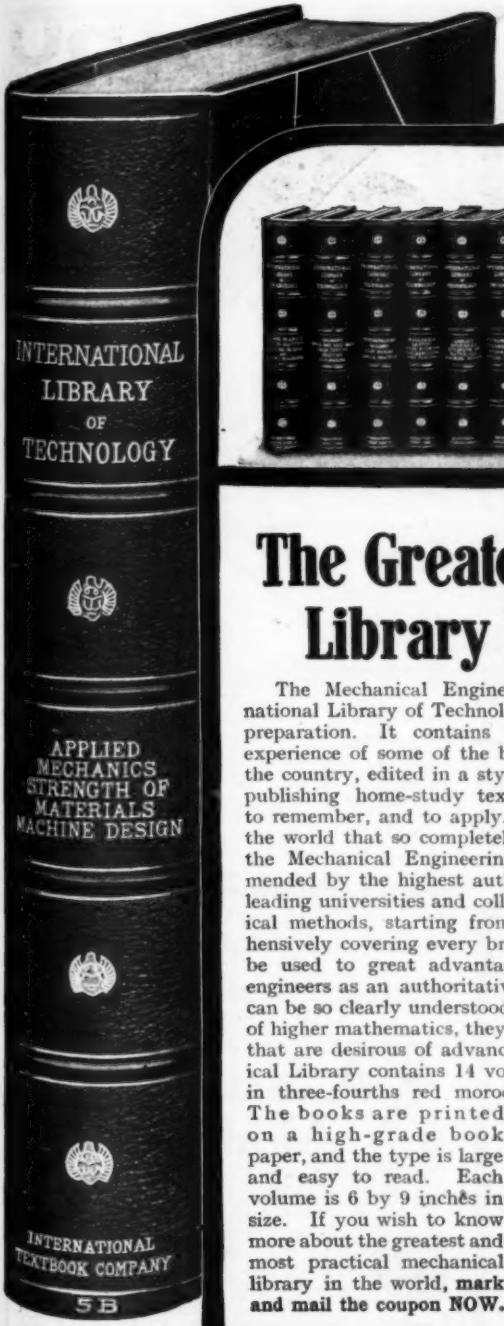

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No wonder you feel nervous and out of sorts after a day's work; no wonder you have blue streaks and pessimistic spells; no wonder your back aches and your feet hurt. Save your energy by fitting your shoes with

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Heels of New Live Rubber

O'Sullivan's Heels make walking easy. They are cushions of live rubber, and that means rubber with the spring in it.

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They mean a return to Nature, for they make every footfall like a step on soft, springy grass.

O'Sullivan's Heels cost fifty cents a pair (attached); their use is an economy, for they last longer than leather heels, and they help to keep shoes in shape. Made for everybody—men, women and children.

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The business that's almost sure to make you well-off. Large profits — modest investment. No dull seasons. You can make money, spring, summer, fall and winter. Everybody buys popcorn and peanuts the year 'round.

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Kingery has started Thousands—Let him start you Now! He'll treat you right

Jos. Lyman, New York state, says:—"More than satisfied with machine and the way you did business with me. Took in **$7.80 in 3 hours.**" Many prosperous men owe their good fortune to a Kingery machine. Just read these extracts from letters written to Kingery. B. A. Knight, Mo. (town of only 1000) writes, "Taken in **$109.60 first 30 days.** Am well pleased." W. H. Green, Ala., old man of 70, one arm, writes, "Average sales **$40 a month in town of only 1,200.**" W. L. Johnson, Okla., writes, "Took in **$4.00 first afternoon.**" F. L. Lainson, Ia., says, "Sold **200 sacks of corn in 3 hours, last Saturday.**" C. W. Buckley, Ohio, after 2 days' use, writes, "**Have sold 50 lbs. peanuts.** Am well pleased." Letter after letter like these, come to Kingery constantly.

Think of the Field! The Big Opportunities!

Popcorn and peanuts are in demand on the street, in parks, dancing pavilions, at circuses, summer resorts; on trains, at depots, theatres, moving picture shows, in front of stores, around in the residence portions—everywhere.

Use the best popcorn and peanuts. Put them in a nice, neat package—"The Kingery way"— hand out with a smile or cheery word and you should do a big business. With certain machines, men add gum, cigars, candies, etc., and make money in this line. Kingery tells you how in his free book—gives you the benefits of his 31 years in the business—he helps you in every way he can.

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Confectionery shops, fruit stores, news stands, groceries, etc., can make a lot of money on the side with a Kingery machine. It's a valuable addition to any retail business. Kingery makes all kinds of machines to suit every need, from a small roaster to big wagons. A style to fit every need at right prices and easy terms.

Better Your Financial Condition

Become well-off. Have a nice bank account; own a home; buy a farm; send your children to college; do a lot of things you'd like, with the profits from this wonderful business. It comes in nickels, but the nickels come fast and the biggest part of the nickel is **your profit.** Better write Kingery today. Ask for his free book, "**Possibilities**" and his handsome catalog No. 41-B. Tell him how you're fixed—what you're doing now—about your town, etc. Needn't write a long letter unless you want to. Write with a pencil, on a postal, if it suits you better. Just say—"Kingery, tell me how I can make money in the peanut and popcorn business." Address simply,

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We will sell you rich Canadian land for from $11 to $30 per acre. You need pay only **one-twentieth down. Think of it—only one-twentieth** down, and then the balance in 19 equal annual payments. Long before your final payment comes due your farm will have paid for itself over and over again. Many good farmers in Western Canada have paid for their farms with one crop.

We Lend You $2,000 for Farm Improvements

An offer of a $2,000 loan for farm development, with no other security than the land itself, **guarantees our confidence** in the fertility of the soil and in your ability to make it produce prosperity for you and traffic for our lines.

The $2,000 loan will help you in erecting your buildings and making things easier at the start, and you are given 20 years in which to fully repay this loan. While enjoying the use of this money you pay only the banking interest of 6 per cent.

Advance of Live Stock on Loan Basis

The Company, in case of approved land purchaser who is in a position and has the knowledge to take care of his stock, will advance cattle, sheep and hogs up to the value of $1,000 on a loan basis, so as to enable the settler to get started from the first on the right basis of mixed farming.

Farms Made Ready by Experts if Desired If you want a place already established select one which our department of agricultural experts has developed. On our Ready-Made-Farm, house and other buildings are up, well is dug, farm fenced, fields cultivated and in crop, all waiting for those who want an immediate start and quick results—all planned and done by men who know—our own agricultural specialists. Take 20 years to pay if you want to.

We give **free** service—expert advice—the valuable assistance of great demonstration farms, in charge of agricultural specialists employed by the Canadian Pacific for its own farms. This service is **yours—free.**

This Great Offer Is Based on Good Land

The Canadian Pacific offers you the finest land on earth for grain growing, cattle, hog, sheep and horse raising, dairying, poultry, vegetables and general mixed farming—irrigated lands for intensive farming—non-irrigated lands with ample rainfall for mixed and grain farming. Remember, these lands are located on or near established lines of railway, near established towns.

Your new home and your fortune are ready for you in the famous, fertile Canadian West, with its magnificent soil, good climate, churches, public schools, good markets, good hotels, unexcelled transportation—**and 20 years in which to pay for your farm and repay the improvement loan.** Here is the Last Best West—where **your** opportunity lies. Don't delay. Mail the coupon below at once. The best land will be taken first—so time is precious for you. **Write today.**

G. E. THORNTON, Colonization Commissioner
Canadian Pacific Railway Colonization Department
112 West Adams St., Chicago, Ill.

FOR SALE—Town lots in all growing towns—Ask for information concerning Industrial and Business openings in all towns.

☐ Book on Manitoba ☐ Book on Saskatchewan ☐ Book on Alberta
(Make a cross in the square opposite the book wanted)

G. E. THORNTON, Colonization Commissioner,
Canadian Pacific Railway Colonization Department,
112 West Adams St., Chicago, Ill.
Please send me the books indicated above.

Name.....
Address.....
Town..... State.....

DRAW BIG MONEY!

Yes: $125 to $175 Per Month to Start

I know you would like to draw such a salary and more, and you positively will earn this amount easy when you are a thorough

Practical Trained Draftsman and Designer

The constant demand for my trained men always exceeds the supply. Many positions paying $75 to $100 per week remain open on account of the shortage of the proper men to fill them. Some weeks over 250 positions paying the highest salary in all parts of the country are open and I would like to prove this to you by sending you one of my regular weekly lists of open positions.

Chief Draftsman Will Train You Personally and Instruct You Properly

On practical Drafting room work UNTIL you are absolutely competent in every respect as a first class Draftsman and UNTIL you are placed in a permanent paying position at a salary paying at least $125 per month. This is a most exceptional opportunity for just a limited few selected ambitious men, between the ages of 16 and 40, whom I will train personally and give individual Instruction as required in order to fill the constant demand for properly trained men in this line.

Absolutely FREE! this Complete $15 Draftsman's Working Outfit

IF You Write to Me AT ONCE

By sending the FREE COUPON on bottom of this page for my most liberal FREE OFFER for the $15.00 Draftsman's Working Outfit, and also for my special offer to

Earn Big Money at Once While Learning at Home

Yes, my friend, you can make big money at once right at home from the very start—as much as **$5 to $10 per day.** I will pay you while learning.

I give **EACH** of my students my own PERSONAL ATTENTION—therefore, I limit the number of my students and if you desire such an opportunity then get busy NOW and WRITE TO ME AT ONCE. Don't wait until tomorrow, but do it TO-DAY. You can earn much more than I charge for my spare time and personal training. This is not a money making correspondence school. We NEED good men to fill good paying positions and my practical working training is the result of the most urgent need for Draftsmen.

With my twenty-two years' experience as Chief Draftsman in handling men, I know exactly how urgent good men are needed all the time, and I will give you the benefit of my twenty-two years' experience at this work and will make you as high grade a man as you desire to be. You can draw $125 to $175 per month and steadily keep on going higher, as many good men draw $5,000 per year in this line. You can do the same if you will grasp this opportunity.

Remember: You can be earning good money while you are learning at home to do the practical Drafting room work.

Mail FREE COUPON at once for my book "Successful Draftsmanship," also list of open positions and for the free offer to be earning good money at once while you are learning at home. This offer is positively limited and in order to benefit thereby you must act AT ONCE—not tomorrow but TO-DAY.

I Guarantee

To instruct you UNTIL competent and placed in a permanent paying position at a regular Draftsman's salary of at least $125 to $175 per month and **guarantee** to furnish you free the complete Draftsman's working Outfit at once from the start.

FREE BOOK and EARNING while LEARNING Offer Coupon

Chief Draftsman,
Division 1194,
Engineer's Equipment Co.,
Chicago, Ill.

Without any obligation on me whatsoever, please mail your book "Successful Draftsmanship" and full particulars of your liberal "Personal Instruction" offer to a few students. It is understood that I am obligated in no way whatever.

NAME.....

ADDRESS.....

Address: Chief Draftsman
Engineer's Equipment Co. (Inc.)
Division 1194 CHICAGO, ILL.

Save money, time and shop equipment 30 Days Free Trial

HERE is a tool grinder with artificial diamond wheels that makes tool sharpening amazingly easy—and the low cost extra attachments transform it into 17 other machines—jig saw, rip saw, forge, lathe, drill, etc. Try it free for 30 days. Then, after 30 days' free trial, send it back at my expense if you feel you can afford to do without it.

LUTHER SHOP TOOL GRINDER

DIMO-GRIT, the new artificial diamond sharpening substance, cuts steel as emery cuts soft copper. No danger of drawing temper, no water cooling needed. Just a light touch of the wheels peels the steel away in tiny shavings. 25 times faster than grindstone, 10 times more efficient than emery. DIMO-GRIT Wheels will not wear lopsided or glaze. They outwear any number of grindstones, which is one money-saving—they make tools last longer and save time, another money-saving. They make tool sharpening so easy that your tools are always in perfect edge, making all your general work easier, quicker, and increasing production, which means **money-making.**

The Luther Shop Tool Grinder, foot and engine power—is built of steel and iron—nothing to wear out—enclosed shaft drive like an automobile, dust-proof bearings—runs easy as a sewing machine—DIMO-GRIT Wheels turn 2500 revolutions per minute—every part built like a high grade lathe. Tool rests and sharpening attachments enable anyone to do difficult grinding such as sharpening twist drills, chisels, plane bits, gumming saws, etc.

This outfit saves work, time and money more ways than any other machine in your shop. Write for free book and pick out the outfit you want for 30 days' free trial.

LUTHER GRINDER MFG. CO.
1809 Michigan St., MILWAUKEE, WIS.

30 Days Free Trial

No money needed, no promises to make—return this coupon and get Free 40 page book, and pick out the outfit you would like to try. I will send it to you free—use it like your own for 30 days—sharpen all your tools—then if you do not wish to keep it, return it at my expense. No hard feelings if you do.

The wonderful scientific story of artificial abrasives is told in this free book—a marvelous story of science.

14 Tools in One

The Luther shop outfit includes 14 attachments and accessories. 1—Fine Dimo-Grit wheel. 2—Coarse Dimo-Grit wheel. 3—Universal tool rest. 4—Chisel and plane bit guide. 5—Dimo-Grit razor hone. 6—Dimo-Grit scythe stone. 7—Dimo-Grit saw gummer. 8—Felt polishing wheel. 9—Medium Dimo-Grit wheel. 10—Cloth buffing wheel. 11—Dimo-Grit oil stone. 12—Dimo-Grit pocket hone. 13M—Plane bit honing attachment. 14M—Twist drill sharpening attachment. The 17 extra attachments, jig saw, drill, forge, lathe, etc., enable you to get a full shop equipment at amazingly low cost.

LUTHER GRINDER MFG. CO.
1809 Michigan St., Milwaukee, Wis.

Please send me 40-page free book from which I can select a Luther Grinder outfit for 30 days' free trial, should I decide to do so. This puts me under no obligations of any kind.

Name.....

Address.....

W. F. HALL PRINTING COMPANY, CHICAGO

Williams'

PATENTED Holder Top Shaving Stick

You used to throw away this much of your Shaving Stick

You can use Williams' Holder Top Stick down to the very end. Grip the metal cap that holds the stick. Your fingers need never touch the soap, not even when there is only the thinnest wafer of it left. No matter how much or how little remains, you have absolute ease of manipulation always. Add to this feature the rich, creamy, luxurious lather that has made Williams' Shaving Soaps famous and you have the perfect shaving stick.

Four forms of the same good quality:

Williams' Shaving Stick (in the Hinged-cover Nickeled Box)
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A single sample of either of the above articles sent for 4 cents in stamps.

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